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EE/CA and RI/FS Support Sampling Plan

Sauget Area 1

Sauget and Cahokia, Illinois

Volume 2

Soil, Groundwater, Surface Water, Sediment and Air FSP, QAPP and HASP

and

Laboratory Quality Assurance Plan

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Submitted To:

U.S. Environmental Protection Agency
Chicago, Illinois

Submitted By:

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Figures

Appendices

1.0 EE/CA and RI/FS Support Sampling Plan

The objective of this EE/CA and RI/FS Support Sampling Plan (SSP) is to further determine the extent of contamination at the Site beyond that defined by previous site investigations. This plan contains a description of equipment specifications, required analyses, sample types, and sample locations and frequency. The plan addresses specific hydrologic, hydrogeologic and air transport methods including, but not limited to, geologic mapping, geophysics, field screening, drilling and well installation, flow determination, and soil, water, sediment, sludge, and waste sampling to determine the extent of contamination. Data requirements are identified for specific remedial technologies that may be necessary to evaluate removal and remediation activities in the EE/CA and the RI/FS.

Solutia is committed to performing the work required by the January 21, 1999 Administrative Order on Consent and Scope of Work (AOC/SOW) in a responsive, responsible and cost-effective manner that is consistent with the National Contingency Plan (NCP). Solutia is the only PRP signatory to the AOC; more than twenty other PRPs declined to participate in the investigation of Dead Creek and evaluation of short-term removal actions for acute threats to the community and the environment and long-term remedies for chronic threats to the community and the environment.

The Sauget Area 1 Support Sampling Plan Engineering Evaluation/Cost Analysis for Soil, Surface Water, Sediment and Air and Remedial Investigation/Feasibility Study for Groundwater sets forth the steps Solutia plans to undertake in performing the work required by the AOC SOW. This is a complicated project because of the age of the sites, the varied nature of the contaminants and the number of sites requiring investigation.

Six source areas exist in the head waters of Dead Creek: Site G, Site H, Site I, Site L, Site M and Site N. The AOC SOW requires collection of waste, groundwater and air samples at all six of these fill areas. Wastes in these sources, which have an estimated total area of greater than 30 acres, came from a wide variety of municipal and industrial sources. Current Agency estimates indicate that these sites have a total volume in excess of 400,000 cubic yards. Site

G is a fill area stabilized by USEPA in an emergency response that solidified organic wastes, placed a temporary soil cover over the site and controlled site access by installation of a fence. Recent inspection indicates the site is still stable. Site H is a grass field at the intersection of two major roads, Queeny Avenue and Falling Springs Road. It is across the street from the Cahokia Village Hall. Recent inspection indicates the site is stable with a vegetative cover and no wastes exposed at the surface. Cinders are present at the surface in some areas of the site. Commercial buildings and a self-storage facility are located on the site. Site I is stable since it underlies a large, fenced, controlled-access, gravel-covered truck parking lot, the Sauget Village Hall and paved parking lots.

Site L, which is covered with cinders, is located in a vegetated field and appears stable. Site M is a water-filled borrow pit hydraulically connected to Dead Creek. Its banks are well vegetated and there is no evidence of current erosion and/or transport of sediments to Dead Creek. For these reasons the site is considered stable. Site N is located at the rear of a former construction company site that is now occupied by what appears to be a sign company. The stability of Site N could not be assessed because it was not visible from publicly accessible areas. Evidence of site clearing across the entire parcel was readily discernible from Fallling Springs Road. This site reportedly contains construction rubble.

Dead Creek was divided by IEPA into six segments during past investigations: Creek Segments A, B, C, D, E and F. One segment, Creek Segment A, was remediated in 1990 and 1991 by Cerro Copper under an IEPA-approved plan and needs no further characterization. The AOC SOW requires collection of soil, sediment, surface water, sediment and ecological samples in Creek Segments B, C, D, E and F.

All five media (soil, groundwater, surface water, sediment and air) are being investigated at the six source areas and soil, groundwater, sediment and surface water are being investigated in the Dead Creek watershed. Analytical parameters include VOCs, SVOCs, Metals, Mercury, Cyanide, PCBs, Pesticides, Herbicides and Dioxin. The human health risk assessment will evaluate exposure of indoor industrial workers, construction/utility workers, residents, recreational teenagers and recreational fishers to soil, groundwater, surface water, sediments

and air. The ecological risk assessment will evaluate benthic community structure and the impact of surface water, sediments, benthic organisms, vegetation, crawfish and fish on six assessment endpoint organisms: 1) large mouth bass, 2) mallard duck, 3) great blue heron, 4) bald eagle, 5) muskrat and 6) river otter.

This Support Sampling Plan presents a comprehensive investigation of the extent of migration of site-related constituents away from six source areas via the soil, groundwater, surface water, sediment and air pathways in a large study area more than three miles long. It includes a comprehensive evaluation of human health and ecological risks associated with migration of site-related constituents. Solutia intends to perform the work in accordance with the AOC and the NCP.

The Support Sampling Plan is submitted in accordance with the requirements of the AOC and SOW; the March 19, 1999 USEPA comments on the February 22, 1999 Draft Support Sampling Plan; the March 25, 1999 telephone conference call between Solutia and USEPA, USACE, Weston and IEPA regarding the Agency's March 19, 1999 comments; the March 26, 1999 telephone conference call between Solutia and USEPA, USACE and IEPA on the Agency's March 19, 1999 comments and the May 29, 1999 USEPA, USACE and Weston comments on the April 9, 1999 Support Sampling Plan.

Solutia responded positively to all comments made by USEPA, USACE, Weston and IEPA in March 1999 and incorporated these responses into the Support Sampling Plan with two exceptions: 1) a description of ownership and 2) collection of groundwater samples west of Route 3. Ownership records for a three mile long study area with hundreds of property owners are too voluminous to include in this document. Solutia proposes that these documents be maintained separately from the Support Sampling Plan. Furthermore, the Agency and the IEPA have a recent study by Ecology and Environment that sets forth ownership of the properties.

Extensive groundwater characterization data will be collected east of Route 3 as part of the SSP. Before collecting groundwater samples west of Route 3, where there are a number of

other sources (this area is part of Sauget Area 2 and contains sites that are likely source areas themselves, e.g. the former Midwest Rubber facility, the old Darling Fertilizer facility and the Clayton Chemical facility), Solutia is proposing to evaluate the data from the currently planned SSP groundwater data collection effort to determine if site-related constituents have migrated as far as Route 3 before a decision is made as to whether or not groundwater sampling west of Route 3 is necessary as a Sauget Area 1 study activity. If such sampling is necessary, Solutia is prepared to propose an appropriate supplement to this SSP to conduct such sampling.

Solutia reviewed all of the May 29, 1999 USEPA, USACE and Weston comments and most of them were included in the June 25, 1999 Support Sampling Plan.

The Support Sampling Plan consists of the following documents:

Volume 1A Support Sampling Plan
Volume 1B Human Health Risk Assessment Work Plan
Volume 1C Ecological Risk Assessment Work Plan
Volume 1D EE/CA Report Work Plan
Volume 1E RI/FS Report Work Plan

Volume 2A Soil, Groundwater, Surface Water and Air Field Sampling Plan
Volume 2B Soil, Groundwater, Surface Water and Air Quality Assurance Project Plan
Volume 2C Soil, Groundwater, Surface Water and Air Health and Safety Plan

Volume 3A Ecological Sampling QAPP/FSP
Volume 3B Ecological Sampling Health and Safety Plan

Volume 4 Data Validation Plan

Specific requirements of the January 21, 1999 AOC SOW are addressed in the corresponding sections of the Support Sampling Plan as outlined below:

AOC SOW Work Element		Support Sampling Plan Volume
Task 1	EE/CA and RI/FS Support Sampling Plan	Volume 1A, Section 1.0
	Site Background	Volume 1A, Section 2.0

	Description	Volume 1A, Section 3.0
	Waste Characterization	Volume 1A, Section 3.1
	Hydrogeologic Investigation	Volume 1A, Section 3.2
	Soils and Sediment Investigation	Volume 1A, Sections 3.3 and 3.4
	Surface Water Investigation	Volume 1A, Section 3.5
	Air Investigation	Volume 1A, Section 3.6
	Ecological Investigation	Volume 1A, Section 3.8
	Pilot Tests	Volume 1A, Section 3.9
	Sampling Procedures	Volumes 2A, 2B and 3A
	Health and Safety Plan	Volumes 2C and 3B
	Schedule	Volume 1A, Section 16.0
Task 2	EE/CA and RI/FS Support Sampling	
	Waste Characterization	Volume 1A, Section 5.0
	Hydrogeologic Investigation	Volume 1A, Section 6.0
	Soils and Sediment Investigation	Volume 1A, Sections 7.0 and 8.0
	Surface Water Investigation	Volume 1A, Section 9.0
	Air Investigation	Volume 1A, Section 10.0
	Ecological Investigation	Volume 1A, Section 11.0
	Pilot Tests	Volume 1A, Section 12.0
Task 3	Data Report	Volume 1A, Section 13.0
Task 4	EE/CA Report for Soil, Sediment, Sediment and Air (including a streamlined human health risk assessment and an ecological risk assessment	Volumes 1B, 1C and 1D
Task 5	RI/FS Report (Groundwater)	Volumes 1B, 1C and 1E
	RI Report	
	Risk Assessment for Groundwater	
	Establish Remedial Action Goals	
	Feasibility Study	

2.0 Site Background

Sauget Area 1 is located in the Villages of Sauget and Cahokia, St. Clair County, Illinois. The study area is centered on Dead Creek, an intermittent stream that is approximately 17,000 feet long, and its floodplain. Three closed municipal/industrial landfills (Sites G, H and I), one backfilled wastewater impoundment (Site L), one flooded borrow pit (Site M) and one backfilled borrow pit (Site N) are present in the study area which also includes six creek segments:

Creek Segment A	Alton & Southern Railroad to Queeny Avenue
Creek Segment B	Queeny Avenue to Judith Lane
Creek Segment C	Judith Lane to Cahokia Street
Creek Segment D	Cahokia Street to Jerome Lane
Creek Segment E	Jerome Lane to Route 157
Creek Segment F	Route 157 to Old Prairie du Pont Creek

These sites and creek segments are shown on Figure 1.

2.1 Land Use

During recent years land use has been consistent in the area surrounding Dead Creek. In a 1988 report prepared for IEPA (Expanded Site Investigation, Dead Creek Project Sites at Cahokia/Sauget, Illinois), Ecology and Environment indicated that "A wide variety of land utilization is present [in the study area]. The primary land use in the town [village] of Sauget is industrial, with over 50% of the land used for this purpose. Small residential, commercial, and agricultural properties are also interspersed throughout the town [village]. Significant land use features, in relation to individual project sites will be discussed below.

Land surrounding the Area 1 project sites is used for several purposes. A small residential area is located immediately east of Sites H and I, across Falling Springs Road. The nearest residence is approximately 200 feet from these sites. The Sauget Village Hall is also located on top of, or adjacent to, Site I .... South of Sites G and L are two small cultivated fields which

are used for soybean production. These fields separate the sites from a residential area in the northern portion of Cahokia. Several small commercial properties are also found in the immediate vicinity of the Area 1 sites." These land use patterns are typical of Dead Creek east of its intersection with Route 3 (Mississippi Avenue). Immediately south of Route 3 there is a residential area. After this developed area, Dead Creek runs through undeveloped area until it reaches the lift station at Old Prairie du Pont Creek.

2.2 Climate

Geraghty and Miller, in a report prepared for Monsanto (Site Investigation for Dead Creek Segment B and Sites L and M, Sauget-Cahokia, Illinois, 1992), indicates that "The climate of the site(s) is continental with hot, humid summers and mild winters. Periods of extreme cold are short. The average annual rainfall in the area for the period from 1903 to 1983 was 35.4 inches, however, precipitation increased to 39.5 inches per year during the period between 1963 and 1988. The average annual temperature is 56°F; the highest average monthly temperature (79 °F) occurs in July and the lowest average monthly temperature (32 °F) occurs in January."

2.3 Hydrology

According to Ecology and Environment (1988) "the project area lies in the floodplain, or valley bottom, of the Mississippi River in an area known as the American Bottoms. For the most part the topography consists, of nearly flat bottom land, although many irregularities exist locally across the site areas.... Generally, the land surface in undisturbed areas slopes from north to south, and from the east toward the river. This trend is not followed in the immediate vicinity of [Sauget Area 1]. Elevations of Area 1 sites range from 410 to 400 feet above mean sea level (MSL) ... Little topographic relief is exhibited across individual sites, with the exception of Sites G ...

Surface drainage in the project area is typically toward ... Dead Creek. However, significant site-specific drainage patterns are present. A brief description of surface drainage for individual sites is given below.

Site G - Drainage at Site G is generally east toward CS-B. A large depression exists in the south-central portion of the site. Surface runoff flows toward the depression [Note: As a result of an emergency response action by USEPA in 1995, Site G is capped and surface water flow is directed radially away from the site].

Site H - Drainage at Site H is typically to the west toward CS-B. Several small depressions capable of retaining rainwater, are scattered across the site. Precipitation in these areas infiltrates the ground surface rather than draining from the site.

Site I - Drainage is generally to the west toward the two holding ponds which make up CS-A [Note: Creek Segment A was closed under an IEPA approved plan in 1990/91. Impacted sediments were removed and transported off-site for disposal, an HDPE membrane vapor barrier was installed, a storm water retention basin was constructed and the site was backfilled to create a controlled-access truck parking lot. Water that used to be impounded in CS-A now drains to the new storm water retention basin]. CS-A also receives surface and roof drainage from the entire Cerro plant area located west of CS-A. This drainage flows through a series of storm sewers and effluent pipes. A large depression exists in the northern portion of Site I [Note: This depression no longer exists]. Precipitation in this area flows toward the depression.

Site L - Site L is a former subsurface impoundment which has subsequently been covered with highly permeable material (cinders). Runoff from the surface, although inhibited by the permeable nature of the cinders, flows toward CS-B.

Site M - Site M receives surface runoff from a small residential area located east and south of the site. Water in Site M eventually drains into CS-B through a cut-through located in the southwest corner of the site.

Site N - Because the excavation which constitutes Site N [is] only partially filled, it receives runoff from the surrounding area. The creek bank in this area is approximately ten feet higher than the lowest point in the excavation.

Dead Creek - Dead Creek serves as a surface water conduit for much of the Sauget and Cahokia area. The creek runs south and southwest through these towns [villages] to an outlet point in the [O]ld Prairie Du Pont [sic] Creek floodway, located south of Cahokia. The floodway in turn discharges to the Cahokia Chute of the Mississippi River. ... Creek Segment A is isolated from the remainder of Dead Creek because the culvert under Queeny Avenue has been blocked with concrete. CS-A drains to an interceptor at the north end of the Cerro property. Water from this interceptor is carried to the Sauget Waste Water Treatment Plant. The culvert is partially blocked at the south end of CS-B, and flow from this Segment to the remainder of the creek is restricted. Although the degree of this restriction has not been determined, it is known that water does not usually flow through this culvert."

2.4 Geology

Geraghty and Miller (1992) described site geology as follows "The site(s) is situated on the floodplain of the Mississippi River. The floodplain is locally named the American Bottoms and contains unconsolidated valley fill deposits composed of recent alluvium (Cahokia Alluvium), which overlies glacial material (Henry Formation). Published information indicates that these unconsolidated deposits are underlain by bedrock of Pennsylvanian and Mississippian age consisting of limestone and dolomite with lesser amounts of sandstone and shale.

The Cahokia Alluvium (recent deposits) consists of unconsolidated, poorly sorted, fine-grained materials with some local sand and clay lenses. These recent alluvium deposits unconformably overlie the Henry Formation which is Wisconsinian glacial outwash in the form of valley train deposits. The Henry Formation is about 100 feet thick. These valley-train materials are generally medium to course sand and gravel and increase in grain size with depth."

2.5 Water Resources

2.5.1 Domestic Water Supply

Ecology and Environment (1988) conducted an evaluation of groundwater and surface water resources and the results of this evaluation are summarized below.

"The primary source of drinking water for area residents is an intake in the Mississippi River. This intake is located at river mile 181, approximately 3 miles north of the DCP [Dead Creek Project] study area. The drinking water intake is owned and operated by the Illinois American Water Company (IAWC) of East St. Louis, and it serves the majority of residences in the DCP area. IAWC supplies water to ... Sauget .... The Commonfields of Cahokia Public Water District purchases water from IAWC and distributes it to portions of Cahokia and Centerville Township. The Cahokia Water Department also purchases water from IAWC and distributes it to small residential areas in the west and southwest portions of Cahokia.

A review of IDPH and ISGS files indicated that at least 50 area residences [within a 3 mile radius of the site] have wells which are used for drinking water or irrigation purposes. These wells are located in Cahokia (23) ....The nearest private wells to any of the DCP sites are located on Judith Lane, immediately south of the Area 1 sites. Based on interviews with these well owners, only one of the five wells located in this area is used occasionally as a source of drinking water and the other four are never used for this purpose.

In summary, although the majority of residences in the general project area are serviced by public water supply systems, well over 50 homes [within a 3 mile radius of the site] utilize private well supplies for drinking water or irrigation purposes."

2.5.2 Industrial Water Supply

Ecology and Environment (1988) also described industrial water usage. "Industrial groundwater usage has been very extensive in the past. Peak use occurred in 1962 when groundwater pumpage exceeded 35 million gallons per day (mgd). Relatively few industries utilize well-supplied groundwater for process or cooling water. Total groundwater pumpage from industrial sources in the project area [3 mile radius] is estimated to be less than 0.5 mgd." [Note: Groundwater usage is probably even lower today given the decline in the region's industrial base.]

2.5.3 Downstream Surface Water Intakes

Ecology and Evironment (1988) indicated that "the nearest downstream surface [water] intake on the Illinois side of the Mississippi River is located at river mile 110, approximately 64 miles south of the project area. This intake supplies drinking water to residents in the Town of Chester and surrounding areas in Randolf County, Illinois. The nearest potentially impacted public water supply on the Missouri side of the river is located at river mile 149, approximately 28 miles south of the DCP area. The Village of Crystal City, Missouri (pop. 4,000) located 28 miles south of the DCP area, utilizes a Ranney well adjacent to the Mississippi River as a source for drinking water. Although this is not actually a surface water intake, it is assumed that the well draws water from the river due to its construction and location adjacent to the river."

2.5.4 Agricultural Water Supply

Ecology and Evironment (1988) reported that "Although agricultural land is found throughout the immediate project area, this land is apparently not irrigated. The nearest irrigated land, other than residential lawns and gardens, is located in the Schmids Lake-East Carondelet area [south of Old Prairie du Pont Creek which is the end of Sauget Area 1]."

2.6 Existing Fill Area Information

USEPA, IEPA, Monsanto/Solutia and Cerro Copper have collected a considerable amount of information on soil, groundwater, surface water and sediment in Sauget Area 1. Information included in the January 21, 1999 AOC is given verbatim below. The location of Sites G, H, I, L, M and N and Creek Segments B, C, D, E and F are shown on Figure 1.

2.6.1 SITE G

"Located south of Queeny Avenue, east of (and possibly under) the Wiese Engineering facility, and north of a cultivated field in the Village of Sauget. CS-B of Dead Creek is located along the eastern boundary of the Site. This site is approximately 5 acres in size and it was operated and served as a disposal area from approximately 1952 to the late 1980's. The Site was fenced in 1988 pursuant to a U.S. EPA removal action under CERCLA which was funded by potentially responsible parties, including Monsanto. On information and belief, wastes located on the surface and/or in the subsurface of Site G have spontaneously combusted and/or burned for long periods of time on several occasions. U.S. EPA conducted a second CERCLA removal action at Site G in 1995. This removal action involved the excavation of PCB, organics, metals, and dioxin contaminated soils on and surrounding Site G, solidification of open oil pits on the Site, and covering part of the Site (including the excavated contaminated soils) with a clean soil cap approximately 18 to 24-inches thick. Site G is enclosed by a fence and is not currently being used. The property is vegetated.

Site G operated as a landfill from approximately 1952 to 1966. The site was subject to intermittent dumping thereafter until 1988, when the Site was fenced. There is an estimated 60,000 cubic yards of wastes within Site G, including oil pits, drums containing wastes, paper wastes, documents and lab equipment. Soil samples collected from Site G revealed elevated levels of VOCs such as chloroform (11,628 ppb), benzene (45,349 ppb), tetrachloroethene (58,571 ppb), chlorobenzene (538,462 ppb), and total xylenes (41,538 ppb). Soil samples also revealed elevated levels of SVOCs such as phenol (177,800 ppb), naphthalene (5,428,571 ppb), 2,4,6-trichlorophenol (49,530 ppb), and pentachlorophenol (4,769,231 ppb). Elevated levels of the pesticide 4,4-DDE were detected up to 135,385 ppb. Elevated levels of PCBs were detected at levels as high as 174,419 ppb (Aroclor 1248) and 5,300,000 ppb (Aroclor

1260). Dioxin levels in soils at Site G were detected at levels as high as 44,974 ppb. Metals were detected at elevated concentrations such as arsenic (123 ppm), barium (45,949 ppm), copper (2,215 ppm), lead (3,123 ppm), mercury (34.3 ppm), nickel (399 ppm), and zinc (4,257 ppm). Samples collected from wastes which appeared to be a pure solid product material on Site G revealed PCB levels as high as 3,000,000 ppb and dioxin levels in excess of 50,661 ppb.

Groundwater samples collected from beneath Site G revealed elevated levels of VOCs such as trans-1,2-dichloroethene (200 ppb), 1,2-dichloroethane (480 ppb), trichloroethene (800 ppb), benzene (4,100 ppb), tetrachloroethene (420 ppb), toluene (7,300 ppb), and ethyl benzene (840 ppb). Elevated levels of SVOCs were detected such as 1,2,4-trichlorobenzene (1,900 ppb), naphthalene (21,000 ppb), 4-chloroaniline (15,000 ppb), and 2,4,6-trichlorophenol (350 ppb). An elevated concentration of PCBs was detected at 890 ppb (Aroclor 1260). Elevated metals in groundwater beneath Site G included arsenic (179 ppb), mercury (2.1 ppb), nickel (349 ppb), zinc (1,910 ppb) and cyanide (350 ppb)."

2.6.2 SITE H

"Located south of Queeny Avenue, west of Falling Springs Road and west of the Metro Construction Company property in the Village of Sauget, it occupies approximately 5 to 7 acres of land. The southern boundary of Site H is not known with certainty but it is estimated that the fill area extends approximately 1,250 feet south of Queeny Avenue. Site H is connected to Site I under Queeny Avenue and together they were known to be part of the Sauget-Monsanto Landfill [Note: Sauget used to be known as Monsanto until the name of the village was changed] which operated from approximately 1931 to 1957. Site H is not currently being used and the property is graded and grass-covered with some areas of exposed slag.

Due to the physical connection to Site I, waste disposal at Site H was similar to that at Site I. Chemical wastes were disposed of here from approximately 1931 to 1957. Wastes included drums of solvents, other organics and inorganics, including PCBs, para-nitro-aniline, chlorine, phosphorous pentasulfide, and hydrofluosilic acid. Municipal wastes were also reportedly

disposed of at Site H. The estimated volume of wastes in Site H is 110,000 cubic yards. There is no containment beneath Site H. Soil samples collected at Site H revealed elevated levels of VOCs such as benzene (61,290 ppb), tetrachloroethene (5,645 ppb), toluene (76,450 ppb), chlorobenzene (451,613 ppb), ethyl benzene (12,788 ppb), and total xylenes (23,630 ppb). Elevated levels of SVOCs were also found in soil samples such as 1,4-dichlorobenzene (30,645,161 ppb), 1,2 dichlorobenzene (19,354,839 ppb), 1,2,4-trichlorobenzene (7,580,645 ppb), 4-nitroaniline (1,834,000 ppb), phenanthrene (2,114,000 ppb), and fluoranthene (1,330,000 ppb). Soil samples also revealed elevated levels of PCBs such as Aroclor 1260 (18,000,000 ppb), and pesticides 4,4DDE (780 ppb), 4,4-DDD (431 ppb), and 4,4-DDT (923 ppb). Elevated levels of metals were found such as arsenic (388 ppm), cadmium (294 ppm), copper (2,444 ppm), lead (4,500 ppm), manganese (36,543 ppm), mercury (3.9 ppm), nickel (15,097 ppm), silver (44 ppm), and zinc (39,516 ppm).

Groundwater samples collected from beneath Site H revealed elevated levels of VOCs such as chloroform (3,000 ppb), benzene (4,300 ppb), and toluene (7,300 ppb). Elevated levels of SVOCs were detected in groundwater such as phenol (950 ppb) and pentachlorophenol (650 ppb). An elevated level of PCBs (Aroclor 1260 at 52 ppb) was also detected in groundwater at Site H. Elevated levels of metals were also detected in groundwater such as arsenic (8,490 ppb), copper (2,410 ppb), nickel (17,200 ppb) and cyanide (480 ppb)."

2.6.3 SITE I

"Located north of Queeny Avenue, west of Falling Springs Road and south of the Alton & Southern Railroad in the Village of Sauget it occupies approximately 19 acres of land. Segment CS-A of Dead Creek borders Site I on the Site's western side. The site is currently graded and covered with crushed stone and used for equipment and truck parking. Site I was originally used as a sand and gravel pit which received industrial and municipal wastes. Site I is connected to Site H (see below) under Queeny Avenue and together they were known to be part of the "Sauget-Monsanto Landfill." The landfill operated from approximately 1931 to 1957. On information and belief, wastes from Site I leached and/or were released into CS-A and available downstream creek segments until CS-A was remediated in 1990. [Note: The culvert

between Creek Segment A and Creek Segment B was blocked in the 1970s.] On information and belief, Site I served as a disposal area for contaminated sediments from historic dredgings of Dead Creek Segment A.

On information and belief, this site accepted chemical wastes from approximately 1931 to the late 1950's. Municipal wastes were also disposed of in Site I. Site I contains approximately 250,000 cubic yards of contaminated wastes and fill material. No subsurface containment is in place beneath Site I. Soil samples collected from Site I have revealed elevated levels of volatile organic compounds (VOCs) such as 1,1,1-trichloroethane (1,692 ppb), trichloroethene (3,810 ppb), benzene (24,130 ppb), tetrachloroethene (5,265 ppb), toluene (77,910 ppb), chlorobenzene (126,900 ppb), ethyl benzene (15,070 ppb), and total xylenes (19,180 ppb). Soil samples also revealed elevated levels of semi-volatile organic compounds (SVOCs) such as 1,3-dichlorobenzene (70,140 ppb), 1,4 dichlorobenzene (1,837,000 ppb), 1,2-dichlorobenzene (324,000 ppb), naphthalene (514,500 ppb), and hexachlorobenzene (1,270,000 ppb). Soil samples also revealed elevated levels of polychlorinated biphenyls (PCBs), such as Aroclor 1260 (342,900 ppb), and the pesticides 4,4-DDD (29,694 ppb), 4,4-DDT (4,305 ppb) and toxaphene (492,800 ppb). Elevated levels of metals were also found in soils, such as beryllium (1,530 ppm), copper (630 ppm), lead (23,333 ppm), zinc (6,329 ppm) and cyanide (3,183 ppm).

Groundwater samples collected from beneath Site I have revealed elevated levels of VOCs such as vinyl chloride (790 ppb), trichloroethene (279 ppb), benzene (1,400 ppb), tetrachloroethene (470 ppb), toluene (740 ppb), and chlorobenzene (3,100 ppb). Elevated levels of SVOCs were also detected in groundwater, such as phenol (1,800 ppb), bis-(2-chloroethoxy)methane (2,900 ppb), 1, 2, 4-trichlorobenzene (2,700 ppb), 4-chloroaniline (9,600 ppb), and pentachlorophenol (2,400 ppb)."

2.6.4 SITE L

"Located immediately east of Dead Creek CS-B and south of the Metro Construction Company property in the Village of Sauget. Site L is the former location of two surface impoundments

used from approximately 1971 to 1981 for the disposal of wash water from truck cleaning operations. This site is now covered by black cinders and is used for equipment storage. On information and belief, Site L wastes have migrated into Site M (see below).

This site was originally used as a disposal impoundment from approximately 1971 to 1981. The volume of contaminated fill material in Site L is not known, however, the area of the impoundment is estimated to be 7,600 square feet. There is no known containment of wastes beneath Site L. Soil samples collected at Site L revealed elevated levels of VOCs such as chloroform (20,253 ppb), benzene (4,177 ppb), and toluene (26,582 ppb). Elevated levels of SVOCs were also detected such as 2-chlorophenol (2,152 ppb), pentachlorophenol (58,228 ppb), and di-n-butyl phthalate (2,784 ppb). Total PCBs were found at a level of 500 ppm in soils. Elevated levels of metals were detected such as antimony (32 ppm), arsenic (172 ppm), and nickel (2,392 ppm).

Groundwater samples collected from beneath Site L revealed elevated levels of VOCs such as chloroform (730 ppb) and benzene (150 ppb). SVOCs were also detected in groundwater such as phenol (150 ppb), 2-chlorophenol (130 ppb)., 4-methyl phenol (75 ppb), 2-nitrophenol (41 ppb), and 4-chloroaniline (60 ppb). Elevated levels of metals in groundwater included arsenic (14,000 ppb), cadmium (32 ppb) and zinc (2,210 ppb)."

2.6.5 SITE M

"Located along the eastern side of Dead Creek CS-B (south of Site L) at the western end of Walnut Street in the Village of Cahokia. Site M was originally used as a sand borrow pit (dimensions = 220 feet by 320 feet) in the mid to late 1940's. The pit is hydrologically connected to Dead Creek through an eight-foot opening at the southwest portion of the pit. On information and belief, wastes from CS-B have in the past and potentially continue to migrate into Site M via this connection. The site is currently fenced.

Site M was originally constructed as a sand borrow pit in the mid to late 1940's. This pit is approximately 59,200 square feet in size and previous investigations indicate that

approximately 3,600 cubic yards of contaminated sediments are contained within the pit. It is estimated that the pit is approximately 14 feet deep and it is probable that there is a hydraulic connection between this pit water and the underlying groundwater. Surface water samples collected from Site M revealed elevated levels of VOCs such as chloroform (27 ppb), toluene (19 ppb) and chlorobenzene (33 ppb). SVOCs detected in surface water included phenol (28 ppb), 2-chlorophenol (14 ppb), 2,4-dimethyl phenol (13 ppb), 2,4-dichlorophenol (150 ppb), and pentachlorophenol (120 ppb). Pesticides detected in surface water include dieldrin (0.18 ppb), endosulfan II (.06 ppb), 4,4-DDT (0.24 ppb), 2,4-D (47 ppb) and 2,4,5-TP (Silvex) (3.4 ppb). PCBs were also detected in surface water at a maximum level of 0.0044 ppb

Sediment samples collected from Site M revealed elevated levels of VOCs such as 2-butanone (14,000 ppb), chlorobenzene (10 ppb) and ethyl benzene (0.82 ppb). SVOCs detected in sediments included 1,4-dichlorobenzene (40 ppm), 1,2-dichlorobenzene (26 ppm), 1,2,4-trichlorobenzene (14 ppm), pyrene (27 ppm), fluoranthene (21 ppm), chrysene (12 ppm), and benzo(b)fluoranthene (15 ppm). Total PCB levels were detected as high as 1,100 ppm. Elevated levels of metals were also detected in sediments at Site M, including antimony (41.2 ppm), barium (9,060 ppm), cadmium (47.2 ppm), copper (21,000 ppm), nickel (2,490 ppm), silver (26 ppm), zinc (31,600 ppm), lead (1,3[illegible]0 ppm), arsenic (94 ppm) and cyanide (1.3 ppm)."

2.6.6 SITE N

"Located along the eastern side of Dead Creek CS-C, south of Judith Lane and north of Cahokia Street in the Village of Cahokia. This Site encompasses approximately 4 to 5 acres of previously excavated land used to dispose of concrete rubble and demolition debris. The excavation began in the 1940's and the site is currently inactive and fenced.

Initially developed as a borrow pit in the 1940's, this Site has been filled with concrete rubble, scrap wood and other demolition debris. The depth of the fill may be as much as 30 feet and it occupies approximately 4 to 5 acres of land. Soil samples collected from Site N revealed the

presence of SVOCs such as phenanthrene (434 ppb), fluoranthene (684 ppb), and pyrene (553 ppb). An elevated level of mercury (9 ppm) was also detected in soil at Site N."

2.7 Existing Dead Creek Information

According to the AOC,

"Dead Creek stretches from the Alton & Southern Railroad at its northern end and flows south through Sauget and Cahokia for approximately 3.5 miles before emptying into the Old Prairie du Pont Creek, which flows approximately 2,000 feet west into a branch of the Mississippi River known as the Cahokia Chute. For many years, Dead Creek has been a repository for local area wastes. On December 21, 1928, an easement agreement between local property owners and representatives of local business, municipal and property interests was executed to "improve the drainage in that District (Dead Creek) by improving Dead Creek so as to make it suitable for the disposal of wastewater, industrial waste, seepage and storm water." Thereafter, Dead Creek systematically received direct and indirect discharges from local businesses and from the Village for many years to come.

Creek Segment CS-A is the northernmost segment of the creek. It is approximately 1,800 feet long and 100 feet wide, running from the Alton & Southern Railroad to Queeny Avenue. This segment of the creek originally consisted of two holding ponds which were periodically dredged. For several years, CS-A and available downstream segments (e.g., ones that were not blocked off) received direct wastewater discharges from industrial sources and served as a surcharge basin for the Village of Sauget (formerly the Village of Monsanto) municipal sewer collection system. When the system became backed up or overflowed, untreated wastes from industrial users of the sewer system were discharged directly into CS-A. On several occaisions, CS-A was dredged and contaminated sediments were disposed of onto adjacent Site I. IN 1968, the Queeny Avenue culvert, which allowed creek water to pass from CS-A to CS-B, was permanently blocked by the Village of Sauget.

Remediation work was conducted by Cerro Copper in CS-A in 1990. Approximately 27,500 tons of contaminated sediments were removed to RCRA and TSCA permitted facilities. CS-A is now filled and covered with crushed gravel. Land use surrounding CS-A is industrial.

Creek Segment CS-B extends for approximately 1,800 feet from Queeny Avenue to Judith Lane. Sites G, L and M border this creek segment. Land use surrounding CS-B is primarily commercial with a small residential area near the southern end of this segment. Agricultural land lies to the west of the creek and south of Site G. In 1965, the Judith Lane culvert, which allowed creek water to pass from CS-B to CS-C, was blocked. CS-B is hydrologically connected to Site M by a manmade ditch (see above).

Creek Segment CS-C extends for approximately 1,300 feet from Judith Lane south to Cahokia Street. Site N borders this creek segment. Land use is primarily residential along both sides of CS-C.

Creek Segment CS-D extends for approximately 1,100 feet from Cahokia Street to Jerome Land. Land use is primarily residential along both sides of CS-D.

Creek Segment CS-E extends approximately 4,300 feet from Jerome Lane to the intersection of Illinois Route 3 and Route 157. Land use surrounding CS-E is predominantly commercial with some mixed residential use. Dead Creek temporarily passes through corrugated pipe at the southern end of CS-E.

Creek Segment CS-F is approximately 6,500 feet long and extends from Route 157 to the Old Prairie du Pont Creek. CS-F is the widest segment of Dead Creek and a large wetland area extends several hundred feet out from both sides of the creek.

Information on the types of wastes disposed of and the types and levels of contamination found at the Sauget Area 1 Site have been provided to U.S. EPA from various sources, including, but not exclusively from: 1) CERCLA 103(c) Submittals; 2) CERCLA 104(e) Responses; 3) Expanded Site Investigation Dead Creek Project Sites (E & E, 1988); 4)

Removal Action Plan for Dead Creek Sites (Weston-SPER, 1987); 5) Description of Current Situation at the Dead Creek Project Sites (E & E, 1986); 6) Site Investigations for Dead Creek Segment B and Sites L and M (Geraghty & Miller, Inc. 1992); 7) Site Investigation/Feasibility Study for Creek Segment A (Advent Group, 1990); 8) Preliminary Ecological Risk Assessment for Sauget Area 1, Creek Segment F (E & E,1997); 9) EPA Removal Action Report for Site G (E & E 1994); 10) Area One Screening Site Inspection Report; and 11) Site Investigation Feasibility Study for Creek Segment A (Advent Group 1990)."

2.7.1 Creek Segment A

"Approximately 20,000 cubic yards of contaminated material were removed from this segment of Dead Creek in 1990, and the area was then backfilled with clean material. The assumption that only low-levels of residual contamination may currently exist within CS-A is yet to be confirmed. Prior to remediation activities, soil and sediment samples collected from CS-A revealed elevated levels of VOCs such as 1,2-dichloroethene (15,000 ppb), trichloroethene (100,000 ppb), tetrachloroethene (11,000 ppb), chlorobenzene (31,000 ppb), ethyl benzene (80,000 ppb), and xylene (500,000 ppb). Elevated levels of SVOCs detected in soils and sediments included 1,3-dichlorobenzene, 4-chloroaniline (17,000 ppb), acetophenone (24,000 ppb), 1, 2, 4, 5-tetrachlorobenzene (28,000 ppb), pentachlorobenzene (37,000 ppb), phenathrene (14,000 ppb), and pyrene (10,000 ppb). Elevated levels of PCBs (total) were also detected at a maximum concentration of 3,145,000 ppb. Elevated levels of metals were also detected in soils and sediments in CS-A including silver (348 ppm), arsenic (194 ppm), cadmium (532 ppm), copper (91,800 ppm), mercury (124 ppm), nickel (6,940 ppm), lead (32,400 ppm), antimony (356 ppm), selenium (41.6 ppm), and zinc (26,800 ppm)."

2.7.2 Creek Segment B

"Elevated levels of VOCs and SVOCs were detected in sediment samples collected from CS-B such as benzene (87 ppb), toluene (810 ppb), chlorobenzene-(5,200 ppb), ethyl benzene (3,600 ppb), trichlorobenzene (3,700 ppm), dichlorobenzene (12,000 ppm), chloronitrobenzene (240 ppm), xylenes (540 ppm), 1,4-dichlorobenzene (220,000 ppb),

1,2-dichlorobenzene (17,000 ppb), phenanthrene (15,000 ppb), fluoranthene (11,000 ppb), pyrene (13,000 ppb). Elevated levels of PCBs exist within CS-B at levels as high as 10,000 ppm. Elevated levels of metals were also detected in sediments in CS-B including arsenic (6,000 ppm), cadmium (400 ppm), copper (44,800 ppm), lead (24,000 ppm), mercury (30 ppm), nickel (3,500 ppm), silver (100 ppm), and zinc (71,000 ppm).

Surface water samples collected from CS-B revealed elevated concentrations of VOCs such as chloroform (27 ppb), 1,1-dichloroethene (3 ppb), toluene (20 ppb), and chlorobenzene (33 ppb). SVOCs detected in surface water included phenol (28 ppb), 2-chlorophenol (14 ppb), 1,4-dichlorobenzene, 2-methyl phenol (4 ppb), 4-methyl phenol (35 ppb), 2,4-dichlorophenol . (150 ppb), naphthalene (8 ppb), 3-nitroaniline (9 ppb), and pentachlorophenol (120 ppb). Pesticides were also detected in surface water samples including dieldrin (0.18 ppb), 4,4-DDT (0.24 ppb), 2,4-D (47 ppb) and Silvex (3.4 ppb). An elevated level of PCBs (aroclor 1260) was also detected in the surface water of CS-B at a level of 44 ppb. Elevated levels of metals were detected in surface water such as aluminum (9,080 ppb), barium (7,130 ppb), arsenic (31 ppb), cadmium (25 ppb), chromium (99 ppb), copper (17,900 ppb), lead (1,300 ppb), mercury (8.6 ppb), nickel (1,500 ppb), and zinc (10,300 ppb)."

2.7.3 Creek Segment C

"Elevated levels of VOCs and SVOCs were detected in sediments in this segment of Dead Creek including fluoranthene (4,600 ppb), pyrene (4,500 ppb), benzo(a)anthracene (3,300 ppb), chrysene (4,400 ppb), benzo(b)fluoranthene (7,500 ppb), benzo(a)pyrene (4,500 ppb), indeno(1,2,3-cd)pyrene (4,300 ppb), benzo(g, h, I) perylene (1,500 ppb), dibenzo(a, h)anthracene (4,000 ppb), and 4-methyl-2-pentanone (1,200 ppb). PCBs (total) were also detected in sediments from CS-C at a maximum concentration of 27,500 ppb. Sediment samples also revealed elevated levels of metals such as copper (17,200 ppm), lead (1,300 ppm), nickel (2,300 ppm), zinc (21,000 ppm) and mercury (2.81 ppm).

Surface water samples collected from creek segment CS-C revealed elevated levels of metals such as lead (710 ppb), mercury (1.9 ppb), and nickel (83 ppb)."

2.7.4 Creek Segment D

"Elevated concentrations of VOCs and SVOCs were detected in sediment samples collected from CS-D including 4-methyl-2-pentanone (1,200 ppb), benzo(b)fluoranthene (500 ppb), indeno(1, 2, 3-cd)pyrene (310 ppb), and dibenzo(a, h)anthracene (360 ppb). PCBs (total) were detected in sediments at a maximum concentration of 12,000 ppb. Elevated concentrations of metals were also detected such as cadmium (42 ppm), copper (1,630 ppm), lead (480 ppm), mercury (1 ppm), and zinc (6,590 ppm).

Surface water samples collected from CS-D revealed elevated concentrations of metals such as cadmium (8.1 ppb), lead (89 ppb), and nickel (189 ppb)."

2.7.5 Creek Segment E

"Elevated concentrations of VOCs and SVOCs were detected in sediment samples collected from CS-E including chlorobenzene (120 ppb), pyrene (5,300 ppb), benzo(b)fluoranthene (2,400 ppb), and chrysene (2,800 ppb). Elevated levels of PCBs (total) were also detected at a maximum concentration of 59,926 ppb. Elevated levels of metals were also detected in the sediments of CS-E including cadmium (23.1 ppm), copper (8,540 ppm), lead (1,270 ppm), mercury (1.53 ppm), nickel (2,130 ppm), and zinc (9,970 ppm)."

2.7.6 Creek Segment F

"Elevated concentrations of VOCs and SVOCs were detected in the sediments of CS-F such as toluene (29 ppb), 4-methyl phenol (1,100 ppb), fluoranthene (310 ppb), and pyrene (340 ppb). Pesticides were also detected in the sediments such as 4,4-DDE (97 ppb), endrin (66 ppb), endosulfan 11 (203 ppb), and methoxychlor (8 ppb). PCBs (total) were also detected in

sediments at a maximum concentration of 5,348 ppb. Elevated levels of metals were also detected in the sediments such as arsenic (276 ppm), lead (199 ppm), mercury (0.55 ppm), cadmium (23.5 ppm), copper (520 ppm), nickel (772 ppm) and zinc (4,520 ppm). Elevated concentrations of dioxins were also detected in sediments in CS-F at a maximum concentration of 211 picograms per gram."

2.8 Existing Data

In 1998, Ecology and Environment prepared a report (Sauget Area 1 Data Tables/Maps) for USEPA Region 5 that "summarized existing technical and potentially responsible party (PRP) data for each subunit of the sites along with other information compiled during E & E's file searches of various agencies and organizations." This report contains the following information obtained from work done by Illinois EPA (IEPA), Ecology and Environment (E&E), Weston, Geraghty & Miller (G&M) and The Advent Group.

Volume 1 - Sauget Area 1

Introduction
Report Organization
Site G
- Site Narrative
- Analytical Data Summaries
  - Sediment Samples - Organics and Metals (IEPA, 1984)
  - Surface Soil Samples - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1986)
  - Subsurface Soil Samples - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1987)
  - Soil Samples - PCB and PCP (Weston, 1987)
  - Waste/Soil Samples - Metals and Organics (IEPA, 1984)
  - Soil Samples - VOCs (G&M, 1991)
  - Soil Samples - BNAs, Metals, Pesticides/PCBs (E&E, 1986)
  - Soil Samples - VOCs, BNAs, Pesticides/PCBs (IEPA, 1994)

Site H
- Site Narrative
- Analytical Data Summaries
  - Subsurface Soil Samples - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1987)

Site L
- Site Narrative
- Analytical Data Summaries
  - Subsurface Soil Samples - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1987)
  - Soil Samples - PCBs (IEPA, 1981)

Sediment Samples - VOCs, BNAs, PCBs, Metals 9G&M, 1991)
Subsurface Soil Samples - TCLP Metals, VOCs, BNAs, Pesticides/PCBs (G&M, 1991)

Site I
- Site Narrative
- Analytical Data Summaries
  - Subsurface Soil Samples - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1987)

Creek Segment A
- Site Narrative
- Analytical Data Summaries
  - Subsurface Soil Samples - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1987)
  - Sediment Samples - VOCs, BNAs, Metals, Pesticides/PCBs (E&E, 1986)
  - Surface Water Samples - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1986)
  - Soil Samples - PCBs, Metals (IEPA, 1981)
  - Sediment Samples - Metals and Organics (IEPA, 1981)
  - Surface Water Samples - Metals and Organics (IEPA, 1981)
  - Soil/Sediment Samples - VOCs, BNAs, PCBs, PCB Precursors, Metals (Advent Group, 1990)

Site M
- Site Narrative
- Analytical Data Summaries
  - Surface Water Samples - VOCs, BNAs, Metals, Pesticides/PCBs (E&E, 1986)
  - Sediment Samples - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1986)
  - Sediment/Surface Water Samples - VOCs, BNAs, Metals, PCBs, RCRA Hazardous Characteristic Parameters (G&M, 1992)
  - Water/Sediment Samples - Metals and Organics (IEPA, 1980)
  - Surface Water Samples - VOCs, BNAs, Pesticides/PCBs, Metals, Herbicides (IEPA, 1994)
  - Soil/Sediment Samples - Metals (IEPA, 1980)

Creek Segment B
- Site Narrative
- Analytical Data Summaries
  - Sediment Soil Samples - VOCs, BNAs, Metals, Pesticides/PCBs (E&E, 1986)
  - Surface Water Samples - VOCs, BNAs, Metals, Pesticides/PCBs (E&E, 1986)
  - Sediment Samples - BNAs, VOCs, Metals (G&M, 1991)
  - Soil/Sediment Samples - Metals, Pesticides/PCBs, VOCs, BNAs (G&M, 1991)
  - Sediment Samples - RCRA Hazardous Characteristic Parameters (G&M, 1991)
  - Soil Sediment Samples - Organics, Phosphorus, Metals (IEPA/Monsanto, 1980)
  - Surface Water Sample - Metals (Eastep, 1975)
  - Surface Water Samples - VOCs, BNAs, Metals, Pesticides/PCBs (IEPA, 1993/94)
  - Soil/Sediment Samples - Metals, Organics (IEPA, Sept. 1980)
  - Soil/Sediment Samples - Metals, Organics (IEPA, Oct. 1980)

Site N
- Site Narrative
- Analytical Data Summaries
  - Subsurface Soil Samples - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1986)

Creek Segment C

- Site Narrative
- Analytical Data Summaries
  - Sediment Samples - VOCs, BNAs, Metals, Pesticides/PCBs (E&E, 1986)
  - Surface Water Samples - VOCs, BNAs, Pesticides/PCBs, Metals, (E&E, 1986)
  - Sediment/Soil Samples - Metals and Organics (IEPA, 1980)
  - Water Samples - Metals and Organics (IEPA, 1980)
  - Soil Samples - Metals and Organics (IEPA, 1991)
  - Sediment Samples - Metals (IEPA, 1980)
  - Surface Water Samples - VOCs, BNAs, Metals, Pesticides/PCBs (IEPA, 1993)
  - Water Samples - Metals (IEPA, 1980)

Creek Segment D
- Site Narrative
- Analytical Data Summaries
  - Sediment Samples - VOCs, BNAs, Metals, Pesticides/PCBs (E&E, 1986)
  - Surface Water Samples - VOCs, BNAs, Pesticides/PCBs, Metals, (E&E, 1986)
  - Sediment Samples - VOCs, SVOCS, Pesticides/PCBs, Inorganics, Metals (IEPA, 1991)

Creek Segment E
- Site Narrative
- Analytical Data Summaries
  - Sediment Samples - VOCs, SVOCS, Pesticides/PCBs, Inorganics, Metals (IEPA, 1991)
  - Sediment Samples - Metals and Organics (IEPA, 1980)
  - Water Samples - Metals and Organics (IEPA, 1980)
  - Sediment Samples - Metals (IEPA, 1980)
  - Water Samples - Metals (IEPA, 1980)

Creek Segment F
- Site Narrative
- Analytical Data Summaries
  - Sediment Samples - Metals, PCBs (E&E, 1997)
  - Soil/Sediment Samples - VOCs, SVOCs, Pesticides/PCBs (IEPA, 1991)
  - Sediment Samples - VOCs, SVOCs, Pesticides/PCBs, Inorganics, Metals (IEPA, 1991)
  - Soil/Sediment Samples - Metals and Organics (IEPA, 1990)

Area 1 Groundwater
- Site Narrative
- Creek Segment B - Metals/Indicators (IEPA, 1980)
- Site G - VOCs, BNAs, Metals (E&E, 1987)
- Site H - VOCs, BNAs, Pesticides/PCBs, Metals (E&E, 1987)
- Site I - VOCs, BNAs, Metals, Pesticides/PCBs (E&E, 1987)
- Site L - VOCs, BNAs, Metals, Pesticides/PCBs (E&E, 1987)
- Private Wells - VOCs, BNAs, Pesticide/PCBs, Metals (E&E, 1987)
- Groundwater Monitoring Survey - Organics and Metals (IEPA, 1982)
- Monitoring Well Samples - Metals, Pesticides/PCBs (IEPA, 1980 and 1983)
- Groundwater Samples - VOCs, SVOCs, Pesticides/PCBs, Inorganics (IEPA, 1991)
- Water Samples - PCBs (IEPA and Monsanto, 1980)
- Groundwater Samples - Metals and Organics (IEPA, 1981)

Groundwater Samples - Metals and Organics (IEPA, 1981)
Groundwater Samples - VOCs, SVOCs, Pesticides/PCBs, Metals (IEPA, 1991)

The 1998 Ecology and Environment Sauget Area 1 Data Tables/Maps Report is not included in the SSP at the request of the Agency. A summary of this information will be included in the Support Sampling Plan Data Report.

2.9 Existing Risk Assessments

In 1997 Ecology and Environment prepared the report "Preliminary Ecological Risk Assessment for Sauget Area1, Creek Segment F, Sauget, St. Clair County, Illinois". E&E "was tasked by the United States Environmental Protection Agency (U.S. EPA) to prepare a screening-level ecological risk assessment for the Sauget Area 1, Creek Segment F site ... The objective of this report is to determine whether the site poses no immediate or long-term ecological risk, or if a potential ecological risk exists and further evaluation is necessary."

Conclusions and recommendations of the report are given below:

"Based on this investigation, site contamination does not appear to threaten human health. Sediment contamination levels are below risk-based values and few people enter the site boundaries.

Elevated levels of metals and PCBs may be highly detrimental to the ecology of this site [Creek Segment F]. The presence of arsenic, cadmium, and dioxin greater than SEL guidelines may decrease the species richness of the area. Sensitive species, including the endangered Black-Crowned Night Heron, inhabit the site and therefore, are subject to effects such as acute toxicity, reduced growth, inhibited reproduction, and other adverse effects. Finally, species that feed on contaminated organisms may bioaccumulate the contaminants and become adversely affected.

The contamination on the site [Creek Segment F] warrants further investigation and possible remediation, especially because it provides high quality wetland habitat."

This report is included in the SSP as Appendix A.

3.0 Site Characterization

The January 21, 1999 Administrative Order on Consent Scope of Work identified the site characterization information needed to define the extent of contamination at Sauget Area 1 for purposes of implementing a removal action on the source areas and Dead Creek and for implementing a remedial action for groundwater. In addition, an analysis of currently available data was done to determine the areas of the Site that required characterization data in order to define the extent of contamination for purposes of implementing a removal action on the source areas and Dead Creek and for implementing a remedial action for groundwater.

Sections 5.0 to 12.0 of this SSP address activities designed to provide site characterization data. These sections describe the number, types and locations of additional samples that will be collected as part of this SSP.

3.1 Waste

The AOC SOW requires inclusion of a program in the SSP for characterizing the waste materials at the Site including an analysis of current information/data on past disposal practices, test pits/trenches and deep soil borings to determine waste depths and volume and extent of cover over fill areas, soil gas surveys on and around fill areas and geophysical delineation of potential "hot spot" drum removal areas. Based on the AOC SOW requirements, meetings and telephone conversations with USEPA, USACE, Weston and IEPA and a review of the 1998 Ecology and Environment report, the identified waste characterization data includes:

- Past disposal practices
- Waste depths and volumes
- Extent of cover over fill areas
- Soil gas survey on and around fill areas
- Buried drum and tank identification

Section 5.0, Waste Characterization Sampling Plan, describes the work that will be performed under this SSP to obtain this waste characterization data.

3.2 Groundwater

The AOC SOW requires inclusion of a program in the SSP for performing a hydrogeologic investigation at the Site including assessment of the degree of hazard, regional and local flow direction and quality and local uses of groundwater. In addition, the SSP was required to develop a strategy for determining horizontal and vertical distribution of contaminants and to include slug tests, grain size analyses and upgradient samples. Based on the AOC SOW requirements, meetings and telephone conversations with USEPA, USACE, Weston and IEPA and a review of the 1998 Ecology and Environment report, the identified groundwater characterization data includes:

- Degree of hazard and mobility of constituents
- Discharge and recharge areas
- Regional and local flow direction and quality
- Local uses of groundwater
- Horizontal and vertical distribution of constituents
- Slug tests
- Grain size analyses
- Upgradient samples

Section 6.0, Ground Water Sampling Plan, describes the work that will be performed under this SSP to obtain this groundwater characterization data.

3.3 Soil

The AOC SOW requires inclusion of a program in the SSP for performing a soil investigation at the Site to determine the extent of contamination of surface and subsurface soils, sampling of leachate from the fill areas and sampling of soil in commercial/open areas adjacent to Dead Creek. The AOC SOW indicates that residential soil sampling may also be required depending on the results from the commercial/open area sampling. Based on the AOC SOW

requirements, meetings and telephone conversations with USEPA, USACE, Weston and IEPA and a review of the 1998 Ecology and Environment report, soil characterization data includes:

- Extent of contamination of surface and subsurface soils
- Leachate samples from fill areas
- Soil sampling of residential/commercial areas adjacent to Dead Creek

Section 7.0, Soil Sampling Plan, describes the work that will be performed under this SSP to obtain this soil characterization data.

3.4 Sediment

The AOC SOW requires inclusion of a program in the SSP for performing a sediment investigation at the Site to determine the extent and depth of contaminated sediments in all segments of Dead Creek and its tributaries and surrounding wetland areas. Based on the AOC SOW requirements, meetings and telephone conversations with USEPA, USACE, Weston and IEPA and a review of the 1998 Ecology and Environment report, sediment characterization data includes:

- Extent and depth of contamination in sediments

Section 8.0, Sediment Sampling Plan, describes the work that will be performed under this SSP to obtain this soil characterization data.

3.5 Surface Water

The AOC SOW requires inclusion of a program in the SSP to determine the areas of surface water contamination in Dead Creek and its tributaries and surrounding wetland areas. Based on the AOC SOW requirements, meetings and telephone conversations with USEPA, USACE, Weston and IEPA and a review of the 1998 Ecology and Environment report, surface water characterization data includes:

- Areas of surface water contamination in Dead Creek and its tributaries and surrounding wetland areas

Section 9.0, Surface Water Sampling Plan, describes the work that will be performed under this SSP to obtain surface water characterization data.

3.6 Air

The AOC SOW requires inclusion of a program in the SSP to determine the extent of atmospheric contamination from the various source areas at the Site and to address the tendency of substances identified through waste characterization to enter the atmosphere, local wind patterns and their degree of hazard. Based on the AOC SOW requirements, meetings and telephone conversations with USEPA, USACE, Weston and IEPA and a review of the 1998 Ecology and Environment report, air characterization data includes:

- Tendency of constituents to enter the atmosphere
- Tendency of constituents to enter local wind patterns
- Degree of hazard

Section 10.0, Air Sampling Plan, describes the work that will be performed under this SSP to obtain air characterization data.

3.7 Ecological Assessment

The AOC SOW requires inclusion of a program in the SSP to collect data for the purpose of assessing the impact, if any, to aquatic and terrestrial ecosystems within and adjacent to Sauget Area 1 resulting from the disposal, release and migration of contaminants. This program must include a description of ecosystems affected, an evaluation of toxicity, an assessment of endpoint organisms and exposure pathways. It also must include a description of toxicity testing or trapping to be done as part of the assessment. Based on the AOC SOW

requirements, meetings and telephone conversations with USEPA, USACE, Weston and IEPA and a review of the 1998 Ecology and Environment report, ecological assessment includes:

- Affected ecosystem description
- Evaluation of toxicity
- Assessment of endpoint organisms
- Exposure pathways
- Toxicity testing or trapping

Section 11.0, Ecological Assessment Sampling Plan, describes the work that will be performed under this SSP to ecological assessment data.

3.8 Pilot Treatability Tests

The AOC SOW requires inclusion of a program in the SSP for any pilot tests necessary to determine the implementability and effectiveness of technologies where sufficient information is not otherwise available. Based on the AOC SOW requirements, meetings and telephone conversations with USEPA, USACE, Weston and IEPA and a review of the 1998 Ecology and Environment report, pilot treatability tests include:

- Waste Incineration
- Waste Thermal Desorption
- Sediment Thermal Desorption
- Sediment Stabilization
- Leachate Treatment

Section 12.0, Pilot Treatability Test Sampling Plan, describes the work that will be performed under this SSP to perform these pilot treatability tests.

4.0 Topographic Map and Sample Location Surveying

4.1 Topographic Map

Surdex, an aerial photography and mapping subcontractor, flew the study area in late March to obtain current aerial photographs of the study area prior to the spring emergence of vegetation. These photographs, combined with ground control surveying, will be used to prepare a topographic map of the study area with a 1 inch = 50 foot scale and a topographic contour interval of 1 ft. This map will consist of 19 30-inch by 40-inch sheets and it will meet National Map Standards with a horizontal accuracy of +/- 1.25 ft. and a vertical accuracy for contour lines of +/- 0.5 ft.

4.2 Location and Elevation Surveying

All sampling locations will be determined in the field using a GPS system capable of producing decimal latitude and longitude readings accurate to one meter. Well elevations will be surveyed to an accuracy of +/- 0.01 ft.

5.0 Waste Characterization Sampling Plan

Fill area samples will be collected in order to characterize the wastes present at each site and to provide information for the human health risk assessment (construction/utility worker exposure). The Human Health Risk Assessment Work Plan is in Volume 1B of the SSP.

5.1 Past Disposal Practices and Analytical Parameter Selection

5.1.1 Overview of Disposal Information Available

Solutia has reviewed disposal practice histories included in prior reports and updated those reports with information submitted to U.S. EPA in 104(e) request responses and 103(c) submittals in order to identify analytical parameters to be used in this SSP. In addition Solutia has reviewed material it has collected pursuant to FOIA requests to the State of Illinois and the U.S. EPA regarding disposal in Sauget Area 1. Also, Solutia has reviewed information it collected in its own private investigations of the Sauget Area 1 sites. Based on this review, it is clear that because of the age of the sites and the characteristics of some of the sites, information regarding disposals in some sites is limited or non-existent. Despite this clear gap in information, Solutia has set forth the information it has that describes possible disposals or releases that occurred at the sites.

5.1.2 Disposals into the Village Sewer and Dead Creek

Up until sometime in the 1930's Dead Creek flowed through the property now occupied by the Solutia's William G. Krummrich ("WGK") plant. In the 1930's the Village of Sauget sewer system was installed. Prior to this installation, industrial process waste water from many of the East St. Louis and Sauget industries flowed directly into Dead Creek. Sometime in the 1930s Monsanto filled in the portion of Dead Creek located on its property. Storm water, not process waters, continued to flow off the property into Dead Creek through a 36-inch culvert under the railroad tracks at the south side of the property.

In 1932 the first public system of sewers was designed for the Village. The new sewers were constructed in 1932 to 1933. This included a 24-inch sewer north of Dead Creek running east to west. It also included an 18-inch sewer line that flowed from Route 3 eastward into Dead Creek. The 18-inch line served Midwest Rubber and possibly Darling Fertilizer. It handled both stormwater and process water. It may have also carried sanitary and commercial waste to Dead Creek.

Sometime between 1939 and 1943 the Village took over maintenance and control of the 36-inch culvert pipe. It also installed Manhole 24 in the 24-inch sewer line at the north end of Dead Creek and ran the 36-inch culvert pipe into the manhole. By connecting the 36-inch pipe to the sewer system, the pipe could act as a conduit for water in the section of Dead Creek south of WGK to flow north into the sewer, and at times of overload on the sewer, the pipe would act as a conduit of sewer backflow into Dead Creek. At about this same time Dead Creek was blocked at Queeny Ave to function as a surge pond for the Village of Sauget sewer system. It can be assumed that this project, which in effect incorporated Dead Creek into the Village sewer system, was paid for, at least in part, by federal funding received by the Village for expansion of the sewer system because of war time industrial development.

In 1935, the creek was dredged between Monsanto's plant and Queeny Avenue. Dredged material was deposited along the east bank. Such dredging may have occurred more than once.

In 1951 additional sewers along Mississippi Avenue were constructed. At this time, the 18-inch overflow line from Mississippi Avenue was connected to the Village sewer system so that normally only storm water would be discharged to Dead Creek and the industrial wastewater was discharged northward and stayed in the Village sewer system. The 18-inch line was still able to act as an overflow for the rest of the system.

Cerro effluent discharged through eight pipes directly into Dead Creek Segment A (CS-A) until 1966 when an interceptor line along Dead Creek was constructed the purpose of which was to discharge Cerro's waste water into the Village sewer system. An interceptor box was

constructed during the Cerro sewer work. It was designed to allow the overflow of wastewater from Manhole 24 to Dead Creek to continue. Even after the interceptor line was installed, it is possible that unidentified sewer discharges from Cerro still entered the creek through the direct discharge pipes and through the Cerro connection to the Village sewer.

The amount of sewer discharges from area industries gradually decreased over the years. In 1966 various industries started to implement process changes that reduced the quantity of wastewater discharged to the sewer. After a 42-inch sewer was constructed by Monsanto in the 1980's, overflows into Dead Creek were likely to occur only during significant rainfall events. After 1984, increased sewer capacity further reduced the frequency of overflows to Dead Creek.

In addition to the 18-inch overflow line that ran from Mississippi Ave. east to Dead Creek Segment B, there were two sewer overflow lines that entered CS-A on the east side. These two overflow lines are in addition to the junction box at the north end of the Creek One outfall was on the north end of CS-A The other line ran west from the 8-inch north-south line along Queeny Avenue to Dead Creek. This line was basically residential but could also have been a source of industrial discharges.

Based on this above description of the history of the use of Dead Creek as part of the Sauget Village sewer system, it is evident that any industry discharging waste waters into the sewer is a suspect source of contamination in Dead Creek and Site I because of the disposal of dredged material from the creek onto Site I.

As of 1929, the following industries were reported as operating in Sauget:

- Cahokia Power Plant
- Darling & Co. Fertilizer
- Evans-Wallower Zinc
- Floyd Plant Co.
- Lewin Metals (now known as Cerro Copper)
- Lubrite Refining (later operated by Mobil)
- Midwest Rubber

- Monsanto Chemical Works
- Sterling Steel Casting Co.

As of 1942, all the above companies were in operation except for Floyd Plant Co and Evans-Wallower Zinc, which presumably had a name change to American Zinc. Added to the list of sewer users by 1942 were Federal Chemical Co. and the U.S. Chemical Warfare Service. Any and/or all of these industries could have been directly discharging into Dead Creek.

The following descriptions give additional information on the industries that are known to have discharged into the Village sewer system:

Amax Zinc

Zinc production started at the Amax Zinc facility in 1929. An electrolytic refinery operates at the Site which has over the years produced the following products:

- Refined zinc metal
- Zinc alloys
- Zinc powders
- Zinc sulfate monohydrate
- Zinc oxide
- Electrolytic or commercial grade sulfuric acid
- Cadmium products
- Raw material used at the plant include zinc sulfide concentrates.

The waste water discharged from the plant contained zinc, copper, iron, cadmium, magnesium and PCBs.

Chemical Warfare Service

The Chemical Warfare Service plant, owned and operated by the U.S. Government, was constructed in the summer of 1940 by Monsanto pursuant to instructions received from the Chemical Warfare Service. After construction, Monsanto operated the plant under the direct supervision and direction of the Chemical Warfare Service. Spills and leaks at the plant were

washed into the plant sewer which was connected to the village sewer. It is likely that process waste water was also discharged into the sewer. Because of government confidentiality restrictions it has been difficult to identify possible contaminants from this source.

Cerro Copper

Cerro has operated a copper smelting operation in Sauget since before 1929. Its predecessor company was Lewin Metals. Generally its operations involve the refining and smelting of copper. In the 1950's, for about 10 years, Cerro manufactured brass rod and tubing. The raw material came from scrap materials (i.e. scrap copper and brass).

Cerro's waste water was known to contain the following contaminants:

- Arsenic
- Cadmium
- Copper
- Nickel
- Zinc
- Antimony
- Beryllium
- Lead
- Silver
- Oil and Grease
- Chloroform
- 1,1,1 Trichloroethane
- Chromium
- Trichloroethene
- Xylene
- Acetone
- Trichloroethylene
- Naphthalene
- Toluene
- Methylene Chloride
- Phenanthrene

Darling Fertilizer

Darling was in the business of manufacturing chemical fertilizers. The process appears to have involved acidulation of phosphate rock and the subsequent blending of the rock with nitrates, lime, etc. The waste water from the plant contained phosphorus and nitrogen. Darling abandoned operations sometime after 1965.

Edwin Cooper & Company (now Ethyl)

Edwin Cooper & Company began operating in Sauget in 1969. Its sewer discharges included acid and oil.

Midwest Rubber

Midwest, located across the street from Site G, began operations in Sauget in 1928. The company reclaimed rubber, principally from discarded automobile tires by heating the ties in autoclaves with caustic solution or chloride solution. Midwest discharged waste directly into the creek through an effluent pipe into CS-B. Waste water would have contained pine tars, naphthalene and other substances such as zinc and waste oil. In 1971 sampling found rubber particles in the discharges as well as zinc. During sampling of waste waters of many Sauget area industries in 1971, it was found that Midwest's waste water flow contained 9 ppb PCBs.

Mobil

Predecessor corporations to Mobil began operation of a refinery in Sauget in 1917. Operations included the production and storage of typical petroleum refining products including a wide range of fuels such as gasoline, kerosene, fuel oils, and residual fuels, and heavier products such as base oils and coke. In 1970 the refinery operations shut down while the terminal operation remained. Wastewater was discharged daily into the Village sewer system plant when the refinery was in operation up to 1970, then intermittently when the fuels terminal was in operation. The wastewater was probably a combination of petroleum process water after primary separation, cooling water and storm water. Mobil's releases to the Village sewer ran down the "south trunk" which was the line that ran directly to the north of CS-A. A May 6,

1982 EPA memo states that Mobil was one of many industries discharging wastes into Dead Creek.

Contaminants in Mobil's waste water included:

- Phenols
- Ammonia nitrogen
- PCBs

Monsanto

From 1917 to 1997 the Monsanto Willliam G. Krummrich plant in Sauget was engaged in the manufacture of various inorganic and organic chemicals including adipic acid, alkylbenzene, benzyl chloride, butyl benzyl chloride, calcium benzene sulfonate, caustic soda, chlorine, chlorinated cyanuric acid, chlorophenols, monnchloroacetic acid, monochlorobenzene, 2,4-D, fatty acid chloride, muriatic acid, nitric acid, 4-nitrodiphenylamine, ortho-dichlorobenzene, ortho-nitrophenol, PCBs, para-dichlorobenzene, para-nitroaniline, para-nitrochlorobenzene, pentachlorophenol, phenol, phosphoric acid, phosphorous trichloride, phosphorus pentasulfide, potassium phenyl acetate, potash, Santoflex, Santomerse, Santolube 393, sulfuric acid, 2,4,5-T, tricresyl phosphate, zinc chloride . The waste water stream leaving the plant varied over the years, but may have contained the following:

- Nitric acid
- Sulfuric acid
- Hydrochloric acid
- Chlorine
- Chlorinated and nitrated aromatics

Rogers Cartage

Rogers Cartage owned and operated a fleet of tanker trucks. It hauled products for many companies in the metropolitan St. Louis area. During Rogers operations in Area 1, it washed

out tanker trucks that had been used to transport product and some wastes for many of the industries in Sauget and the surrounding area. Trucks were washed with caustic solution.

Documentation in the file indicates that Rogers Cartage was a major user of the sewer system. It began using the sewer in 1969. Rinse water was discharged into the Village sewer south trunk which then traveled to the sewer connection at the north end of Dead Creek. Also, there was a 12 inch sewer overflow line that was located at the Rogers Cartage property and discharged directly into Dead Creek. It was installed sometime before 1965. This line was installed to allow relief of the northward traveling sewer line at times of heavy flow. Thus, this line would have caused truck washing waste water to discharge into Dead Creek. A Monsanto memo dated January 5, 1971 indicates that a significant quantity of PCBs in the Village sewer probably came from the Rogers Terminal.

The types of products Rogers hauled which were likely washed into the Village sewer including Dead Creek were:

- Orthonitrochlorobenzene
- Monochlorobenzene
- Orthodichlorobenzene
- Sulfuric Acid
- Maleic Anhydride
- Phosphorus Oxychloride
- Therminol
- Alkylbenzene
- muriatic acid
- Monochloroacetic Acid
- Aroclors
- Oleum
- $POCl_3$ (phosphorus oxychloride)
- PCl_3 (phosphorus trichloride)
- Phenol
- Petroleum and Oil Additives
- Zinc Sulphate solution
- Sulfuric Acid
- Phenol
- Acetone
- Toluene

- Benzene
- Xylene Mixtures

Sauget & Co.

Sauget & Co. operated a landfill at Site I for a number of years. IEPA has reported that waste from Site I would routinely overflow and leach into Dead Creek.

Sterling Steel

Sterling Steel began steel casting operations in the Sauget area in 1922. Wastes from this foundry included spent foundry sand, popcorn slag and quench water scale. Cooling water from electric furnaces, compressors and air conditioning was discharged into the 24-inch sewer line at the north end of Dead Creek. PCB-containing materials were commonly used in casting facilities for fire prevention.

Waggoner

Waggoner started operations on Site L in 1964. Waggoner owned/operated approximately 23 stainless steel trucks and a couple of rubber-lined trucks. It washed its trucks at Site L and drained the tank washings into Dead Creek. In addition, floor drains from the building went directly to Dead Creek. In June 14, 1965 meeting minutes for the Monsanto Village Plant Managers, the statement is made that Waggoner should be persuaded to cease dumping chemicals into Dead Creek. In an August 5, 1971 memo, IEPA states that tanker trucks labeled as corrosive were apparently discharging their contents to Dead Creek near Queeny Avenue. The Agency notified the company of the discharge and Waggoner responded that the discharges had been eliminated. After the IEPA required that discharges to CS-A cease, Waggoner excavated a pit which was used by Waggoner until 1974 when the company was sold to Ruan.

In 1973, the IEPA visited Waggoner and found that a hole had been dug nearby into which the tanker truck washwater discharged. Use of a second pit appears to have begun in 1973.

According to an IEPA memo drafted by Tim Murphy (1992 to USEPA) these pits were designed to overflow into Dead Creek.

Ruan reportedly continued using the pit until 1978. IEPA estimated that between 1971 and 1978, 164,000 gallons of wash water was disposed of in the pit. The pit was not lined and consisted of medium to coarse-grained sand.

The following materials were hauled by Waggoner and thus were likely washed into Dead Creek as rinsate from the truck washings:

- Phosphorous Trichloride
- Phosphorous Oxychloride
- Biphenyl
- Aroclors
- Pyranols
- Phenol
- Alkyl Benzene
- Petroleum Additives (including zinc dibutyldithiophosphate, alkylbenzene sulfonic acid, benzene, sulfonic acid)
- Chloryl acetyl chloride
- Muriatic acid
- Monochloroacetic acid
- Sulfuric Acid
- Chlorosulfuric Acid
- Santolubes
- Other Products handled: (IEPA 4/18/84 Dunn memo to Egan)
  - Chlorosufonic acid
  - Muric acid
  - Sulfuric acid
  - Oleum
  - Plasticizers
  - Caustic metal cleaners
  - Oil additives
  - Phosphoric acid
  - Phostri (commercial name)

5.1.3 Disposals At Sauget Area 1 Source Areas

Documentation of disposals at source areas in Sauget Area 1 is limited. While Monsanto has submitted information to the U.S. EPA that documents its disposals into Site I, no other area industry has presented such information despite the fact that many industries throughout the metropolitan area were using these sites. The following sets forth the limited knowledge available:

American Zinc (Amax)

A former Monsanto employee stated to IEPA that American Zinc dumped material in Sauget. It's waste included copper cake containing copper, nickel and cobalt.

Chemical Warfare Service

The CWS plant operated and owned by the government was in operation while Sites H and I were being used as landfills and possibly while dumping was occurring in Site G. Thus it is likely that wastes from this plant were disposed of in Sites G, H, and I.

Cerro Copper

Cerro used slag from its blast furnace as fill at Site I.

Darling Fertilizer

The Darling plant was operated from sometime in the early 1900s (it was in operation at least by 1929) until 1965. Based on this time frame and its location, it is highly likely that wastes from the Darling plant were disposed of in Sites G, H, and I.

Edwin Cooper

Edwin Cooper began operations in Sauget in 1969. It produced crankcase, gear and hydraulic lubricant additives. Its wastes included diatomaceous earth used to filter products.

Midwest Rubber

Midwest Rubber's wastes included rubber, pine tars and napthalene. Until 1965 Midwest burned rubber that adhered to wires present in tires. Burning ceased in 1965 and the residual was hauled away, possibly to Site G. EPA has found that tire combustion is a source of dioxin. In addition, combustion of tires at the site has caused dense smoke that contained lead, arsenic, cyanide, benzene, PAHs, ethyl mercaptan, etc. all of which are contaminants found in Sauget.

Midwest used PCBs in equipment on site. Waste PCB oil could have been disposed in Area 1.

Monsanto

Monsanto submitted a 103(c) notice in 1981 which identified the "Sauget (Monsanto) Landfill" on Falling Springs Road as receiving wastes from both the WGK plant and the Queeny plant in St. Louis from an unknown date until 1957. These notices indicate that the type of wastes disposed of in the landfill included organics, inorganics and solvents. Based on documents in Monsanto's 104(e) response the wastes disposed at this landfill were waste chemicals, residue, filter aid, waste paper, paper sacks, floor sweepings, garbage, cardboard, fiber packs, steel drums, scrap building materials etc. Because both the WGK and Queeny plants used other disposal sites for their wastes, exactly what was disposed of at the Sauget Area 1 landfills is unknown.

Mobil

In answers to a 104(e) request, Paul Sauget stated that Mobil disposed of material at one or more of sites G, H, and I. Mobil disposed of sludges and beads from its filtering operations. Mobil likely used PCBs in its processes since 54 ppb PCBs were found in Mobil's sewer effluent in 1971.

During the excavations at Site G, a large volume of oily sludges and tar-like wastes were found. Because of the volume, it appears that the material originated from a large refinery operation.

Rogers Cartage

Rogers Cartage owned and operated a portion of Site H from 1968 to 1979. Those operations likely resulted in the release of tank washings on to the ground at the site. The products hauled by Rogers Cartage are listed above.

Sterling Steel

Sterling Steel operated in Sauget from 1922 on. Its processes produced waste that included spent foundry sand and popcorn slag. The sand has been found to be EP toxic for metals

T.J. Moss/ Kerr McGee

From 1927 to1968, T.J. Moss operated a plant in Sauget that treated wood products such as railroad ties and utility poles, in a process that involved treating the wood with creosote, pentachlorophenol and other preservatives.

Operations at the plant under T.J. Moss and its successor Kerr-McGee ("KMCC") were essentially identical. The plant used creosote and "...5% Pentachlorophenol ("penta") in #2-4 diesel." Creosote solutions were utilized over the entire operating history of the plant. Penta was only used from the early 1950's until the plant's closing. Dry penta was used at a rate of 540 pounds per day, (or 1,300 gallons of 5% penta solution per day). In reports to IEPA, KMCC has stated that "assuming the plant treated with...PCP for 19 years (1950 through 1969) it would have consumed about...1300 tons of dry PCP (or 6.2 million gallons of 5% PCP solution)." Monsanto appears to have sold penta to T.J Moss. The facility also used grade #1

Creosote, creosote-coal tar solution and creosote-petroleum solution. Approximately 9,700 gallons of creosote solution were used per day.

Untreated wood waste was allegedly burned in the plant's boiler for heat recovery. Waste waters and storm waster were impounded on site. There is no indication in the report or elsewhere, where the remaining wastes from the site were disposed.

Creosote is a complex mixture of hundreds of individual PAH compounds plus minor amounts of phenolics. At least one of the reports KMCC has been required to submit to the state because of contamination on the KMCC property, sets forth a table summarizing reported analysis for PAH in creosote. Many of the listed PAH's have been found at all the Area 1 sites. In addition penta has been found at most, if not all the Area 1 sites.

Waggoner

Waggoner operated at Site L beginning in 1964. Where it operated before that date is unknown, but it may have washed tanks anywhere in Sauget. During its tank washing processes Waggoner discharged contaminated wash water onto the ground, into lagoons on site and into Dead Creek. A list of the materials hauled by Waggoner is set forth above.

Demolition Debris

There are various references in the Sauget documents that reference the disposal of demolition debris in Site I and possibly at other sites.

Other Disposals

There were numerous industries in the East St. Louis area in the 1940 to 1960 time frame. Any and all of these industries could have disposed of materials in Area 1. These industries included:

- Alcoa
- Certain Teed Corporation
- Eagle Picher Paints
- Lanson Chemical/Purex Corporation
- Morris Paints
- Pfizer Pigments
- Tudor Works

5.1.4 Analytical Parameter List

Based on this review of disposal practice histories, meetings and telephone conversations with USEPA, USACE, Weston and IEPA and a review of the 1998 Ecology and Environment report, the following analytical parameter list is considered appropriate for this SSP:

Volatile Organic Compounds	Method 8260B
Semivolatile Organic Compounds	Method 8270C
Metals	Method 6010B
Mercury	Method 7470A/7471A
Cyanide	Method 9010B
PCBs	Method 680
Pesticides	Method 8081A
Herbicides	Method 8151A
Dioxins	Method 8280/8290

5.2 Waste Depths

Four soil borings will be installed at each of Sites G, H, I, L and N and continuous soil samples will be collected from grade to two feet below the bottom of the fill material which is assumed to be 40 ft. below grade (Figures 2 and 3). Digital photographs of each soil sample will be taken in color against a scale to provide a record of materials present in each fill area (Sites G, H, I, L and N).

The 0 to 0.5 ft. soil sample from each sampling location will be analyzed for the following parameters and used in the Human Health Risk Assessment (Volume 1B):

Number of Soil Samples	20	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxins	Method 8280

One composite waste sample will be collected at each boring location and analyzed for waste disposal characteristics, VOCs, SVOCs, Metals, Mercury, Cyanide, Pesticides, Herbicides, PCBs and Dioxin. Visual observation and PID/FID readings will be used to identify whether or not waste is present in a continuous boring sample. If waste is present, it will be removed, segregated, temporarily stored and used at the completion of the soil boring to prepare a composite waste sample.

Since VOC samples can not be composited without losing volatiles, the waste sample with the highest PID/FID readings will be used for VOC analysis. The entire length of each core sample will be screened immediately upon retrieval from the sampler using a hand-held PID or FID instrument to identify the section of the sample with highest PIR/FID readings. Then the core section with the highest PID/FID reading will be excised and immediately stored in a labeled jar. The core section with the highest PIR/FID reading from each soil boring will be analyzed for VOCs.

Experience at Sauget Area 2 Site R indicates that fill depth is unlikely to be greater than 40 ft. If wastes are encountered at depths greater than 40 ft. bgs, borings will continue until the bottom of the fill is encountered.

Site M will be characterized by collecting four sediment samples at the preliminary locations shown on Figure 4.

Existing information, e.g. the 1988 Ecology and Environment report and the results of the air photo analysis, soil gas surveys and magnetometer surveys conducted as part of the SSP will be used to select boring locations.

Number of Waste Samples	24	
Waste Characterization	Ignitability Corrosivity Reactivity TCLP	 Method 1311
Analyses	VOCs SVOCs Metals Mercury Cyanide PCBs Pesticides Herbicides Dioxins	Method 8260B Method 8270C Method 6010B Method 7471A Method 9010B Method 680 Method 8081A Method 8151A Method 8280

A two-inch diameter well, screened at the bottom of the fill material, will be installed at one waste characterization boring completed at Site G and one waste characterization boring completed at Site I to provide samples for leachate treatability testing.

Additional waste characterization borings may be required by the Agency as a result of variability in waste characteristics observed during the waste characterization boring program.

5.3 Extent of Cover Over Fill Areas

All available historical air photos not included in the 1988 Ecology and Environment report, will be obtained for Sites G, H, I, L and N. These photos, and the results of the E&E evaluation, will be used to define the areal extent of each site. Boundaries of the waste disposal areas will

be defined using historical air photos to establish the areal extent of excavation and fill areas over time. For each photo, the boundaries of Sites G, H, I, L and N will be traced and input into a CADD file. To define the extent of fill, the CADD files will be overlain for each site and a line will be drawn around the outside boundary of the composite fill areas. If stereoscopic evaluation of historical air photographs allows identification of the deepest portion of the fill area, one of the four waste characterization borings will be done at that location.

Results of the analysis of historical air photos will be used to prepare a map for each site showing fill area boundaries and the final selected locations of the boundary confirmation trenches and the waste characterization borings. When the map for each fill area is completed, it will be submitted to the Agency for acceptance prior to performance of the boundary confirmation trenching or collection of the waste characterization samples. Boundary confirmation trenches and waste characterization borings will be located in the field by measuring from known points such as buildings, roads or other cultural features or by using GPS.

Preliminary boundary confirmation trench and waste characterization boring locations are shown on Figures 2 and 3. Test trenches will be used to confirm the boundaries of the fill areas identified through air photo analysis. One trench will be installed on each side of a fill area, a total of four trenches per site. Test trenches will start outside the defined boundary of the fill area and move toward the defined boundary. When fill materials are encountered, the fill area boundary will be compared to boundaries identified based on air photo analysis and considered confirmed. Trenching at that location will be terminated.

All excavated soil and fill material will be returned to the test trench with the exception of any intact drums which will be removed provided confined space entry is not needed to retrieve a drum. Trenches will not be entered to recover drums because of the danger inherent in such activities. Test trench locations will be determined using GPS and recorded for future reference in the event drum removal is appropriate. Recovered drums will be overpacked and stored pending disposal. Free product, solid waste and contaminated soil resulting from rupture of drums during removal will be cleaned up by absorbing any liquid materials and

placing the spent absorbent, solid waste and contaminated soil in bulk containers at a controlled-access, fenced, investigation derived waste (IDW) storage area to be constructed north of Judith Lane adjacent to Dead Creek. Building permits for this facility were obtained in June and construction is scheduled to start in July. Overpacked drums will be also be stored at this facility. Recovered drums will be stored until the capacity of the storage pad is exceeded or the investigation is completed, whichever comes first. Drum and bulk container storage may be indefinite if the IDW contains materials that can not or will not be accepted by off-site disposal facilities, e.g. dioxin. Any waste excavated that identifies the source of material present in the fill area will be noted in the field log and photographed.

Number of Test Trenches 20

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee. Trenching equipment will be hired on a per day basis. If all or part of the planned 20 boundary trenches are finished before the end of a day, additional trenches will be installed at locations approved by the Agency for the remainder of the day provided these areas are covered by access agreements.

Time spent recovering drums will increase the duration of the Support Sampling Plan schedule on a one for one basis, i.e. one day spent removing drums will increase the Support Sampling Plan schedule by one day.

5.4 Waste Volumes

Waste volume will be determined using the areal extent information obtained from historical air photo analysis, boundary confirmation trenching and the depth of fill information obtained from the waste characterization borings at each site.

5.5 Soil Gas Survey

A soil gas survey will be conducted at Sites G, H, I, L and N using a shallow soil probe (5 ft.) and on-site analysis of collected vapors for VOCs. Soil gas samples will be collected at a frequency of one sample per acre. Each sample will be collected at the center point of each grid cell using the following grid spacings (Figures 5 and 6):

Site	Grid Size	Grid Spacing	Number of Samples
G	400 ft. by 600 ft.	200 ft by 200 ft.	6
H	400 ft. by 800 ft.	200 ft. by 200 ft.	8
I	400 ft. by 1200 ft.	200 ft. by 200 ft.	12
L	200 ft. by 200 ft.	200 ft. by 200 ft.	1
N	300 ft. by 300 ft.	200 ft. by 200 ft.	2
		Total Number of Samples	29

If detectable concentrations of VOCs are found in the fill area soil gas samples, the survey will be extended beyond the boundary of the fill area. Soil gas samples will be collected at 100 ft. intervals (0, 100 and 200 ft. from the edge of the fill area) along four 200 ft. long transects (three samples per transect); one transect perpendicular to each side of the fill area. If VOCs are detected in soil gas at each of the five fill areas, it is anticipated that as many as 60 additional soil gas samples may be collected:

Site	Number of Transects	Number of Samples
G	4	12
H	4	12
I	4	12
L	4	12
N	4	12
	Total Number of Samples	60

If twelve additional soil gas samples are not adequate to define the extent of VOC-containing soils associated with each fill area, additional soil gas samples will be collected at 100 ft. intervals along the four sampling transects at each fill area until the limits of the impacted fill

are found. If soil gas surveys need to extend into areas for which there are no property access agreements, soil gas sampling will be suspended until access is obtained.

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

5.6 Buried Drum and Tank Identification

5.6.1 Magnetometer Surveys

Magnetometer surveys will be conducted at Sites G, H, I, L and N to identify anomalies indicative of drum disposal or buried tanks. To determine whether or not the anomalies are associated with buried drums or tanks, test trenches will be dug at: 1) anomalies that coincide with groundwater isoconcentrations greater than 10,000 ppb as identified by the 1998 Ecology and Environment Data Tables/Maps Report, 2) SVE anomalies detected during the soil gas survey, 3) magnetic anomalies identified by the 1988 Ecology & Environment geophysical surveys and 4) areas of drum or tank disposal identified during historical air photo analysis of fill area boundaries. Magnetometer measurements will be made at locations determined by superimposing a 50 ft. by 50 ft. grid on the fill areas:

Site	Grid Size	Grid Spacing	Measurements
G	400 ft. by 600 ft.	50 ft. by 50 ft.	96
H	400 ft. by 800 ft.	50 ft. by 50 ft.	128
I	400 ft. by 1200 ft.	50 ft. by 50 ft.	192
L	200 ft. by 200 ft.	50 ft. by 50 ft.	16
N	300 ft. by 300 ft.	50 ft. by 50 ft.	36
		Total Number of Measurements	468

Magnetometer measurement points will be located in the field by measuring from known points such as buildings, roads or other cultural features or by using GPS.

Existing information on plume concentration, combined with information from the soil gas survey, will be used in evaluating whether or not magnetic anomalies indicate the presence of buried drums or tanks. Fill areas in Sauget Area 1 were used for disposal of municipal and industrial waste as well as construction debris. Magnetic anomalies are likely to be numerous, intense and wide spread in the fill areas. It is appropriate to use a screening method to identify those anomalies that should be excavated to determine if they are due to buried drums or tanks. Comparing groundwater and soil gas concentration highs found at each fill area with corresponding magnetic anomalies at each fill area is a good method for selecting excavation locations within the fill areas provided groundwater and soil gas concentration highs have not migrated beyond the limits of the fill area. Coupling this information with prior geophysical surveys conducted by Ecology and Environment in 1988 and evaluation of historical air photo analysis to identify portions of the fill areas where drums or tanks were placed will allow selection of test trenching locations that focus on areas where tanks or large numbers of drums may be buried.

5.6.2 Test Trenches

If no excavation location criterion other than the presence of a magnetic anomaly is used to determine whether or not an excavation is appropriate, disturbance of a significant portion of each fill area is likely to result. Excessive trenching could result in unacceptable risks to the community, on-site workers and the environment at sites that currently appear to be stable.

Test trenches to confirm the presence of buried drums or tanks will be done at Sites G, H, I, L and N. Site G is a fill area stabilized by USEPA in an emergency response that solidified organic wastes, placed a temporary soil cover the site and controlled site access by installation of a fence. Recent inspection indicates the site is still stable. Site H is a grass field at the intersection of two major roads, Queeny Avenue and Falling Springs Road. It is across the street from the Cahokia Village Hall. Cinders are present at the surface in some areas of the site. Recent inspection indicates the site is stable with a vegetative cover and no wastes exposed at the surface. Commercial buildings and a self-storage facility are located on the site. Site L, which is covered with cinders, is located in a vegetated field and appears stable.

Site N is located at the rear of a former construction company site that is now occupied by what appears to be a sign company.. The stability of Site N could not be assessed because it was not visible from publicly accessible areas. Evidence of site clearing across the entire parcel was readily discernible from Falling Springs Road.

Test trenching will be done to confirm that the presence of buried drums or tanks can be determined using a combination of magnetic anomalies, air photo analysis and soil gas and groundwater data. One test trench will be conducted at the largest magnetic anomaly found at each site that coincides with: 1) drum/tank disposal locations identified by historical air photo analysis, 2) an area of high VOC concentrations in soil gas, 3) an area of high groundwater concentrations identified in the 1998 Ecology and Environment Sauget Area 1 Data Tables/Maps report or 4) major magnetic anomalies report in the 1988 Ecology and Environment Report "Expanded Site Investigation, Dead Creek Project Sites at Cahokia/Sauget, Illinois".

All excavated soil and fill material will be returned to the test trench with the exception of any intact drums which will be removed provided confined space entry is not needed to retrieve a drum. Trenches will not be entered to recover drums because of the danger inherent in such activities. Test trench locations will be determined using GPS and recorded for future reference in the event drum removal is appropriate. Recovered drums will be overpacked and stored pending disposal. Free product, solid waste and contaminated soil resulting from rupture of drums during removal will be cleaned up by absorbing any liquid materials and placing the spent absorbent, solid waste and contaminated soil in bulk containers at a controlled-access, fenced, IDW storage area to be constructed north of Judith Lane adjacent to Dead Creek. Building permits for this facility were obtained in June and construction is scheduled to start in July. Overpacked drums will be also be stored at this facility. Recovered drums will be stored until the capacity of the storage pad is exceeded or the investigation is completed, whichever comes first. Drum and bulk container storage may be indefinite if the IDW contains materials that can not or will not be accepted by off-site disposal facilities, e.g. dioxin. Any waste excavated that identifies the source of material present in the fill area will be noted in the field log and photographed.

Time spent recovering drums will increase the duration of the Support Sampling Plan schedule on a one for one basis, i.e. one day spent removing drums will increase the Support Sampling Plan schedule by one day.

Trenching to remove buried drums or tanks is an activity that should be done, if necessary, as part of a carefully planned removal action or when a remedy is implemented. Solutia is very concerned about the safety of workers, the community and the environment during test trenching and drum removal activities. One release to the atmosphere, which sent five workers to the hospital, occurred during an investigation conducted in Creek Segment A. During World War II, the United States government purchased 15 acres of Monsanto's W.G. Krummrich plant in Sauget, Illinois and built and operated the Chemical Warfare Plant. Solutia does not know what chemicals were used or produced by this facility. It is quite likely that raw materials, waste materials and finished product from the U.S. government's Chemical Warfare Service plant could be present in the fill areas located in Sauget Area 1. For this reason, Solutia believes intrusive activities at Sites G, H and I to identify buried drums and tanks should be kept to an absolute minimum if they are conducted at all. The inherent danger to workers, the public and the environment associated with drum removal activities, limited groundwater downgradient migration of constituents at Sites G, H and I and no downgradient groundwater users must be taken into account when considering drum and tank removal during the site investigation. If large numbers of intact drums are encountered and significant downgradient migration of constituents could occur if they were left in place until a remedy could be implemented, a carefully planned and executed removal action to stabilize the situation could be appropriate.

6.0 Groundwater Sampling Plan

Groundwater samples will be collected in the alluvial aquifer and bedrock at the fill areas, in the alluvial aquifer downgradient of the fill areas and in shallow groundwater and domestic wells adjacent to Dead Creek. The purpose of this sampling is to define current groundwater quality conditions at the source areas, to define the extent of migration away from the source areas and to provide information for the human health risk assessment (construction/utility worker exposure, vapor intrusion into buildings and residential use of groundwater from shallow wells for lawn and garden watering). The Human Health Risk Assessment Work Plan is in Volume 1B.

6.1 Degree of Hazard and Mobility of Constituents

Sample number, sample coordinates and all organic and inorganic constituents detected in groundwater during past investigations of Sauget Area 1 will be compiled into a GIS-compatible data base, along with data from the EE/CA and RI/FS Support Sampling Plan. Frequency of detection, average, maximum, minimum and 95% confidence interval concentrations will be compiled for each detected constituent. Constituent mobility and hazard will be assessed during the human health risk assessment (Volume 1B Human Health Risk Assessment of the SSP).

6.2 Recharge and Discharge Areas

Groundwater conditions in the American Bottoms have been studied extensively by the Illinois State Water Survey, Illinois State Geological Survey and the U.S. Geological Survey. Information from these studies will be used to define recharge and discharge areas.

Experience at Site R, and information from published reports on the American Bottoms aquifer, indicates that groundwater flow patterns in the study area are primarily controlled by the Mississippi River and, to a lesser degree, by Dead Creek. Both drainages run north/south and groundwater will flow toward them in an east/west direction. For groundwater to flow from

Sites G, H, I and N to residences located south of these sites, a strong, local perterbation of the flow system would be needed, for example a high capacity pumping well. Plumes associated with Sites G, H, I and L, as mapped by Ecology and Environment in 1998 (Appendix A), do not indicate any distortion of the plumes toward the residences on Walnut Street and Judith Lane. Intermittent pumping of domestic wells for gardening or lawn watering is unlikely to stress the aquifer enough to cause Constituents to migrate 500 feet cross gradient. Evaluation of historical information, as described in Section 6.3, will determine if high capacity industrial pumping occurred southwest of Site H.

To address Agency concerns that a southwesterly flow direction from the source areas to the residential areas south of Judith Lane and west of Dead Creek may exist, groundwater samples will be collected at three locations on a transect running from Site G to Judith Lane (see Section 6.5.2.3).

6.3 Regional and Local Flow Direction and Quality

Groundwater conditions in the American Bottoms have been studied extensively by the Illinois State Water Survey, Illinois State Geological Survey and the U.S. Geological Survey. Information from these studies will be used to define historical regional and local flow direction and quality. Dead Creek data compiled by Ecology and Environment in 1998 will be integrated into this evaluation.

As directed by the Agency, groundwater flow conditions at the source areas will be determined by installing nine piezometer clusters at the locations shown on Figure 7. Each piezomter cluster will consist of three small-diameter wells completed in the shallow, intermediate and deep portions of the alluvial aquifer. Water levels in each well will be measured quarterly for one year to define seasonal fluctuations in water-level elevations. Water levels in existing wells will also be measured. Water-level elevation maps will be prepared for each quarterly measurement round and included in the Support Sampling Plan Data Report.

6.4 Local Uses of Groundwater

State, county, city and village records will be searched to identify any potential groundwater users along Dead Creek. Domestic wells identified by Ecology and Environment are summarized below:

Owner	Street Address	Water Use	Depth
Allen	101 Walnut Street	Greenhouse	17 ft.
Ballet	3300 Falling Springs Road	Residential	20 ft.
Wright	100 Judith Lane	Residential	-
Settles	102 Judith Lane	Residential	-
Schmidt	104 Judith Lane	Residential	49
McDonald	109 Judith Lane	Residential	-
Lyerla	118 Edwards Street	Residential	-
Hayes	22 Cahokia Street	Residential	-
Baumeyer	24 Cahokia Street	Residential	-

Existing domestic well water quality data are included in Appendix B as directed by USACE. This information was obtained from the 1998 Ecology and Environment Volume 1, Sauget Area 1, Data Tables/Maps Report prepared for USEPA Region 5.

It is important to note that Cahokia and Sauget are served by a public water supply and that these and other homes in the area are served by the municipal water supply system. Both Cahokia and Sauget are believed to have ordinances restricting groundwater use.

6.5 Horizontal and Vertical Distribution of Constituents

Ecology and Environment (1998) defined the areal extent of VOCs and SVOCs in shallow groundwater at Sites G, H, I and L. These plumes have migrated several hundred feet downgradient from disposal sites that were used from the 1930s to the 1970s. Plume shape indicates VOC and SVOC migration is toward the Mississippi River, which is the discharge point for the American Bottoms aquifer. Ecology and Environment did not collect information on COC distribution in the intermediate and deep portions of the aquifer.

Aquifer saturated thickness in the study area is on the order of 80 to 100 ft., perhaps more. A vertical groundwater sampling interval of 20 ft. would result in 4 to 5 groundwater samples per sampling station. A vertical sampling interval of 5 ft. would result in 16 to 20 samples per sampling station. Experience with similar hydrogeologic conditions to those found at Sauget Area 1 indicates that leachate migration from the fill areas should produce plumes with a vertical dimension of more than 5 ft. because the source areas are 30 to more than 50 years old and the aquifer is thick, highly permeable and homogeneous. Under these conditions, plumes are likely to have a vertical dimension of at least 20 ft. if not more. For this reason, a vertical sampling interval of 20 ft. is considered appropriate. However, in order to address Agency concerns about adequate characterization of the plumes, vertical groundwater samples will be collected every 10 ft.

6.5.1 Fill Area Groundwater

6.5.1.1 Shallow Groundwater

As directed by the Agency in its March 19, 1999 comments on the SSP, groundwater concentrations at the source areas will be determined by sampling existing Ecology and Environment wells (Appendix B) EE-01, EE-02, EE-03, EE-04, EE-05, EE-12, EE-13, EE-14, EE-15, EE-20, EEG-101, EEG-102, EEG-103, EEG-104, EEG-105, EEG-106, EEG-107, EEG-108, EEG-109, EEG-110, EEG-111 and EEG-112. Each well will be located, checked for integrity of surface seals, plumbed for depth and matched against construction records, redeveloped to remove accumulated fine-grained materials and promote groundwater entry into the well and sampled to provide data on current groundwater conditions at the source areas. If some or all of these wells no longer exist or can not be sampled, groundwater samples will be collected at the depth of the former screened interval using push sampling technologies such as Geoprobe™, HydroPunch™, MicroWell™, Waterloo Profiler™ or equivalent sampling technology and low-flow sampling techniques.

The location and purpose of sampling these wells are summarized below:

Site	Source Area or Downgradient Well	Shallow Groundwater Background Well	Screen Depth (ft bgs)
Site G	EE-05		18 -23
	EEG-101		18 - 23
	EEG-102		16.5 - 21.5
	EEG-104		19 - 24
	EEG-106		18 -23
	EEG-107		23 - 28
	EEG-112		21 - 26
Site H	EE-01		28 - 33
	EE-02		18 -23
	EE-03		27 - 32
		EE-04	18 -23
	EEG-110		18 - 23
Site I	EE-12		28 - 33
	EE-13		23 - 28
	EE-14		32.5 - 37.5
	EE-15		24 - 29
		EE-20	23 - 28
Site L	EEG-103		16.5 - 21.5
	EEG-105		No Construction Log
	EEG-109		17.5 - 22.55
South of Site G	EEG-111		No Construction Log
		EEG-108	24 - 29

Background groundwater samples will be obtained from the middle and bottom of the aquifer at the location of existing wells EE-04, EE-20 and EEG-108 as described in Section 6.12

Number of Groundwater Samples	19	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A

Herbicides	Method 8151A
Dioxin	Method 8290

6.5.1.2 Alluvial Aquifer Groundwater

As directed by the Agency, one alluvial aquifer saturated-thickness sampling station will be located at the groundwater concentration high at Site H and one alluvial aquifer saturated-thickness sampling station will be located at the groundwater concentration high at Site I (Figure 7). If available records or historical air photographs indicate the location of dredge spoil from Creek Segment A, the Site I alluvial aquifer saturated thickness sampling station will be placed at the location of this spoil instead of at the groundwater concentration high as directed by USACE. Groundwater samples will be collected at this location in order to determine the vertical extent of organic and inorganic constituents migrating away from Sites H and I.

Telescoping surface casing will be installed to a depth of 5 ft. and 20 ft. below the fill material in order to minimize carry-down of site-related constituents during groundwater sample collection. This casing will be grouted from the bottom up after completion of sampling.

Groundwater samples will be collected every 10 ft. from bottom of the surface casing to bedrock, which are assumed to be 60 and 100 ft. deep, respectively, using push sampling technologies such as Geoprobe™, HydroPunch™, MicroWell™, Waterloo Profiler™ or equivalent sampling technology and low-flow sampling techniques.

Number of Groundwater Samples	8	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A

	Dioxin	Method 8290

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

6.5.1.3 Bedrock Groundwater

As directed by the Agency, one bedrock well will be installed in the middle of Sites G, H and I in order to determine the vertical extent of organic and inorganic constituents migrating away from these sites. Telescoping surface casing will be installed to a depth of 5 ft. and 20 ft. below the fill material and 5 ft. into bedrock in order to minimize carry-down of site-related constituents during groundwater sample collection and vertical migration of site-related constituents after completion of sampling.

Bedrock will be cored to a depth of 20 ft. below the telescoping casing. Cores will be digitally photographed in color against a scale and evaluated for porosity by examination and petrographic thin sections. A groundwater sample will be collected from each core hole.

Sampling locations will be based on the fill area shallow groundwater sampling results (Section 6.5.1.1).

Number of Groundwater Samples	3	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

6.5.2 Downgradient Alluvial Aquifer Groundwater

6.5.2.1 Sites G, H and L

The horizontal and vertical extent of organic and inorganic constituents migrating away from Sites G, H and L and toward the Mississippi River will be determined by collecting samples at three sampling stations located along a transect between the maximum shallow groundwater concentrations at Site G and Route 3 (Figure 7). Groundwater samples will be collected every 10 ft. from the water table to bedrock, which is assumed to be 100 ft. deep, using push sampling technologies such as Geoprobe™, HydroPunch™, MicroWell™, Waterloo Profiler™ or equivalent sampling technology and low-flow sampling techniques.

Experience at other sites indicates this push sampling technology such as Geoprobe™ can reach depths of 60 ft. Depth of penetration can be increased at some locations by loosening the soil above the sampling horizon with a small-diameter solid stem auger before pushing the sampling probe to the required sampling depth. When the Geoprobe™ sampler or equivalent sampling technology can not penetrate to the required sampling depth, MicroWells™ will be used to collect groundwater samples. These small-diameter wells are vibrated into place using a small vibratory hammer. Experience in deep aquifers at other sites indicates that sampling depths of 100 ft. can be achieved. If the required sampling depths can not be reached with either of these two technologies, conventional percussion drilling equipment will be used to drive 1-1/4 inch diameter drive points to the required sampling depths.

Number of Groundwater Samples	30	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7470A

	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

6.5.2.2 Site I

The horizontal and vertical extent of organic and inorganic constituents migrating away from Site I and toward the Mississippi River will be determined by collecting samples at three sampling stations located along a transect between the maximum shallow groundwater concentrations at Site I and Route 3 (Figure 7). Groundwater samples will be collected every 10 ft. from the water table to bedrock, which is assumed to be 100 ft. deep, using push sampling technologies such as Geoprobe™, HydroPunch™, MicroWell™, Waterloo Profiler™ or equivalent sampling technology and low-flow sampling techniques.

Number of Groundwater Samples	30	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

6.5.2.3 Areas Southwest of Sites G, H, I and L

The horizontal and vertical extent of organic and inorganic constituents migrating away from Sites G, H, I and L and moving in a southwesterly direction will be determined by collecting

samples at three sampling stations located along a transect between the maximum shallow groundwater concentrations in Site G and Judith Lane (Figure 7). Groundwater samples will be collected every 10 ft. from the water table to bedrock, which is assumed to be 100 ft. deep, using push sampling technologies such as Geoprobe™, HydroPunch™, MicroWell™, Waterloo Profiler™ or equivalent sampling technology and low-flow sampling techniques.

Number of Groundwater Samples	30	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

6.5.2.4 Dioxin Sampling

Presence or absence of dioxin in groundwater migrating away from Sites G, H, I and L will be determined by analyzing samples from the shallow (20 ft. bgs), intermediate (60 ft. bgs) and deep (100 ft. bgs) portions of the alluvial aquifer at each of the three sampling stations downgradient of Sites G, H and L, each of the three sampling stations downgradient of Site I and each of the three sampling stations southwest of Sites G, H, I and L. Samples will be collected concurrently with the VOC, SVOC, Metals, Mercury, Cyanide, PCB, Pesticide and Herbicide samples described above.

Number of Groundwater Samples	27	
Analyses	Dioxin	Method 8290

6.5.3 Bedrock Groundwater

See Section 6.5.1.3.

6.5.4 Domestic Wells

6.5.4.1 Shallow Groundwater

Ecology and Environment (1998) identified several homes on Walnut Street and Judith Lane with private water wells. Shallow groundwater samples will be collected at two sampling stations to determine if site-related constituents are migrating from Dead Creek toward these domestic wells (Figure 7). One sampling station will be located at the end of Walnut Street and the other sampling station will be located on the east bank of Dead Creek at Judith Lane. Groundwater samples will be collected at the water table and at depths of 20 and 40 ft. below ground surface which bracket the typical completion depth of domestic wells in southern Illinois. Push sampling technologies such as Geoprobe™, HydroPunch™, MicroWell™, Waterloo Profiler™ or equivalent sampling technology and low-flow sampling techniques will be used to collect six groundwater samples.

Number of Groundwater Samples	6	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

6.5.4.2 Time-Series Sampling

After collection and analysis of the shallow groundwater vertical-profile samples at Walnut Street and Judith Lane, one MicroWell™ will be installed at each sampling station with its screened interval in the zone of highest detected constituent concentrations. USACE required stressing the aquifer at this sampling location. Time series samples will be collected over a 24-hour period with samples collected at 0, 12 and 24 hours after the start of pumping in order to stress the saturated zone during sampling and determine constituent concentration trends. Pumping rates can not be determined in advance but will be set so that the MicroWell™ can be pumped continuously for 24 hours without drying up.

Number of Groundwater Samples	6	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

6.5.4.3 Domestic Wells

Groundwater samples will be collected from a total of four domestic wells on Walnut Street and Judith Lane that could be used for irrigation or drinking water supply. Preference will be given to sampling wells that were sampled in the past by IEPA in order to provide some degree of historical record. Past domestic well sampling results, extracted from the 1998 Ecology and

Environment report "Volume 1, Sauget Area 1, Data Tables/Maps" are included in Appendix B as directed by USACE.

Number of Groundwater Samples	4	
Analyses	VOCs	Method 8260
	SVOCs	Method 8270
	Metals	Method 6010
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

6.6 Slug Tests

A considerable amount of information on the hydraulic characteristics of the American Bottoms aquifer is available from the Illinois Water Survey, Illinois Geological Survey and US Geological Survey. Public information, augmented by site-specific slug tests, may be all that is needed to design a pump and treat system should such a remedial measure be selected for a site. Performance of a pumping test on a high yield aquifer creates practical problems such as storage, treatment and disposal of large volumes of pumped water. When it is necessary to design a pump and treat system, it may be simpler to use the best available information to design the recovery and treatment system and then add more recovery wells and treatment capacity if the system does not perform as expected. For these reasons, slug testing was selected as the preferred method for determining site-specific aquifer hydraulic characteristics.

Three slug tests will be collected at each fill area (Sites G, H, I, L and N) to determine aquifer hydraulic conductivity. Slug tests will be conducted in the upper, fine-grained zone, the middle

fine sand zone and the lower coarse sand zone typical of the American Bottoms aquifer in this area.

Number of Slug Tests 15

6.7 Grain Size Analyses

One soil boring will be completed adjacent to each fill area (Sites G, H, I, L and N) and soil samples will be collected from the upper, middle and lower aquifer zones using a Geoprobe™ or other suitable push technology. All sampling locations will be selected in the field with the concurrence of the USEPA or its designee. Each soil sample will be analyzed for grain size.

Number of Grain Size Analyses 15

6.8 Upgradient Samples

Existing wells EE-20, EE-04 and EEG-108 will be used as background (upgradient) groundwater sampling locations. These wells, which are screened at depths of 23 - 28, 18 - 23, 24 -29 ft below ground surface, respectively, will be redeveloped as described in Section 6.5.1.1. If these wells cannot be used, Geoprobe™, HydroPunch™, MicroWell™, Waterloo Profiler™ or equivalent sampling technology will be used to collect samples from the center of the former screened intervals at each of these locations using low-flow sampling techniques. In addition, groundwater samples will be at depths of 60 and 100 ft. below grade surface at each of these locations using push sampling technologies such as Geoprobe™, HydroPunch™, MicroWell™, Waterloo Profiler™ or equivalent sampling technology and low-flow sampling techniques. A sampling depth of 60 ft. is approximately the midway between the screened interval of the existing shallow wells and the bottom of the aquifer which is anticipated to be approximately 100 ft. deep.

Number of Groundwater Samples 9

Analyses	VOCs	Method 8260
	SVOCs	Method 8270
	Metals	Method 6010
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

7.0 Soil Sampling Plan

Soil samples will be collected in both undeveloped and developed areas that are susceptible to flooding and deposition of wind-blown dust. Specifically, floodplain soil sampling will be done in an area bounded by Queeny Road on the north, Falling Springs Road on the east, Route 157 on the south and Route 3 (Mississippi Avenue) on the west. This is the area where water backs up at road crossings during heavy rains and where PCBs are known to occur in creek sediments. This area also includes most of the residential development in Sauget Area 1.

Information from the soil sampling program will be used to determine the extent of migration due to overbank flooding and wind-blown dust deposition. In addition, surficial and subsurface soil information will be used in the human health risk assessment (construction/utility worker and residential exposure scenarios). The Human Health Risk Assessment Work Plan is in Volume 1B of the SSP.

Floodplain soil samples will be collected every 200 ft. on seven transects in undeveloped areas, a total of 45 sampling stations. Based on these sampling results, twenty soil sampling stations will be located in developed areas. Three samples will be collected in developed areas adjacent to Transects 1, 2, 3, 4, 5 and 6 and two samples will be collected in developed areas adjacent to Transect 7 which is the transect at the downgradient limit of the residential area. All sampling locations will be selected in the field with the concurrence of the USEPA or its designee. Twenty developed area samples are considered an appropriate number for identification in this SSP until undeveloped area soil samples and Creek Segment B, C, D and E sediment samples are collected and analyzed. Then information on the extent and concentration of constituents in undeveloped area floodplain soils and creek sediments can be used for final selection of developed area sampling locations.

7.1 Extent of Contamination in Undeveloped Area Surface Soils

Surficial (0 to 0.5 ft.) soil samples will be collected every 200 ft. on seven transects perpendicular to Dead Creek to determine the extent of migration via the surface water

(overbank flow) and air (wind blown dust) pathways (Figure 8). Sampling transects are placed in undeveloped areas adjacent to developed areas to allow ready access for sampling.

Transect	Length (feet)	Number of Sampling Stations	Number of Surficial Soil Samples	Number of Subsurface Soil Samples
1	1300	7	7	7
2	1000	6	6	6
3	1300	7	7	7
4	1300	7	7	7
5	1000	6	6	6
6	800	5	5	5
7	1200	7	7	7
	Total	45	45	45

Number of Undeveloped Area Surficial Soil Samples: 45

Analyses	
VOCs	Method 8260B
SVOCs	Method 8270C
Metals	Method 6010B
Mercury	Method 7471A
Cyanide	Method 9010B
PCBs	Method 680
Pesticides	Method 8081A
Herbicides	Method 8151A

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

7.2 Extent of Contamination in Undeveloped Area Subsurface Soils

Subsurface (0.5 to 6 ft.) soil samples will be collected every 200 ft. on seven transects perpendicular to Dead Creek to determine the extent of migration via the surface water (overbank flow) and air (wind blown dust) pathways (Figure 8). Subsurface soil samples will be collected from 0.5 ft to 6 ft below ground surface. Visual observation of discoloration and field PID/FID readings will be used to identify the most impacted portion of the sample which will be

selected for chemical analysis. Discoloration indicates the presence or organic and/or inorganic constituents and PID/FID readings indicate the presence of volatile organics. Surface and subsurface soil sampling stations will be co-located.

Number of Undeveloped Area Subsurface Soil Samples	45	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

7.3 Extent of Contamination in Developed Area Surface Soil Samples

Surficial soil samples (0 to 0.5 ft below ground surface) will be collected in at least 20 locations in developed areas. Soil samples will be collected at three residences adjacent to Transects 1 to 6 and at two residences adjacent to Transect 7.

Number of Developed Area Surface Soil Samples	20	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8280

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

7.4 Extent of Contamination in Developed Area Subsurface Soil Samples

Subsurface soil samples (0.5 to 6 ft below ground surface) will be collected in at least 20 locations in developed areas. Soil samples will be collected at three residences adjacent to Transects 1 to 6 and at two residences adjacent to Transect 7. Visual observation of discoloration and field PID/FID readings will be used to identify the most impacted portion of the sample which will be selected for chemical analysis. Discoloration indicates the presence or organic and/or inorganic constituents and PID/FID readings indicate the presence of volatile organics.

Number of Developed Area Subsurface Soil Samples	20	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

7.5 Dioxin Sampling

To provide information for the human health risk assessment (construction/utility worker exposure), the Agency directed that 20 percent of the subsurface soil samples will be analyzed for dioxin. As directed by USACE, 20% of the surface soil samples will be analyzed for dioxin. Visual observation of discoloration and field PID/FID readings will be used to identify the most impacted portion of the sample which will be selected for chemical analysis. Discoloration

indicates the presence or organic and/or inorganic constituents and PID/FID readings indicate the presence of volatile organics.

Number of Surface Soil Dioxin Samples	13
Number of Subsurface Soil Dioxin Samples	13
Total Number of Analyses	26

Analyses	Dioxin	Method 8280

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

7.6 Background Soil Samples

Background soil samples will be collected at the locations of the background groundwater wells, specifically existing wells EE-20, EE-04 and EEG-108 which are east of Sites I, H and L, respectively. Samples will be collected from a depth of 0 to 0.5 ft. and 0.5 to 6 ft. below ground surface.

Number of Background Soil Samples 6

Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8280

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

7.7 Leachate Samples from Fill Areas

One leachate sample will be collected from Site I and one leachate sample will be collected from Site G using the 2-inch diameter well installed during the waste characterization program completed at each of these fill areas. As directed by USACE, these wells will be stressed so that a representative leachate sample can be collected. Wells will be pumped at a rate that allows continuous discharge without drying up the well and enough volume will be pumped to ensure that water from at least a foot away from the filter pack is drawn into the well before a sample is collected. For an 8-inch diameter borehole, a two-foot long screen and a porosity of 0.3, this amounts to approximately 25 gallons of leachate.

Pumping will be limited by constraints imposed by leachate storage and disposal requirements. These samples will be used in the leachate treatability pilot tests.

7.8 Soil Sampling of Residential/Commercial Areas Adjacent to Dead Creek

See Sections 7.1 through 7.5 above.

8.0 Sediment Sampling Plan

Vertically-integrated sediment samples will be collected in Dead Creek to determine the extent of downstream migration of site-related constituents and to provide information for use in the human health risk assessment (recreational teenager and recreational fishing scenarios) and the ecological risk assessment (endpoint organism exposure to sediments). The Human Health Risk Assessment Work Plan is in Volume 1B of the SSP and the Ecological Risk Assessment Work Plan is in Volume 1C.

As directed by the Agency, sediment samples will be collected at 200 ft. intervals in the undeveloped portions of Dead Creek, i.e. Creek Segments B and F, and at 150 ft. intervals in the developed portions of Dead Creek, specifically Creek Segments C, D and E to determine the extent of migration of industry-specific constituents. A 150 ft. sediment sampling interval was used in the 1991 Geraghty & Miller investigation of Creek Segment B so repeating sample collection at an 150 ft. interval is not considered appropriate in this creek segment even though its southern end passes through a developed area. For this reason, sediment samples will be collected at 200 ft. intervals in Creek Segment B.

Sediment samples will be collected every 1,000 ft. in Dead Creek to determine the extent of migration of site-related constituents.

As directed by USACE, sediment sampling locations in Creek Segments B, C, D, E and the portion of Creek Segment F upstream of the Borrow Pit Lake will be adjusted in the field so that samples are obtained from the upstream and downstream ends of each road culvert at a specified radial distance from the culvert. Samples will be collected within a radial distance of ten feet from the upstream and downstream ends of each road culvert.

The extent of migration information collected as part of this task, coupled with sediment thickness measurements and channel cross sectional area, will provide enough information to determine volume of impacted sediments.

Sediment samples will not be collected in Creek Segment A. This creek segment was used as a storm water detention basin which was dredged a number of times to remove accumulated sediment. Dredge spoil was placed on the creek banks and in Site I. Cerro Copper performed an IEPA-approved remedial action for Creek Segment A in 1990 and 1991. Approximately 20,000 cubic yards of Impacted sediments were excavated from depths of 10 to 15 feet below grade and transported off site for disposal at the Waste Management landfill in Emelle, Alabama. After excavation, an HDPE vapor barrier was installed and Creek Segment A was backfilled. The site is now fenced and used as a controlled-access truck parking lot. Since Creek Segment A was remediated under an agreement with IEPA, no further characterization is considered necessary.

8.1 Extent of Industry-Specific Constituent Migration in Undeveloped Areas

Vertically-integrated sediment core samples will be collected at 200 ft. intervals in Creek Segment B and Creek Segment F to determine the extent of downstream migration of constituents related to specific industrial sources located at the upstream end of Dead Creek (Figure 9). The combined length of these creek segments is approximately 10,000 ft. Industry-specific constituents include PCBs (discontinued chemical manufacturing operation), Total Petroleum Hydrocarbons (closed oil refinery), Copper (active metal refining) and zinc (active metal refining). This information will also be used in the human health risk assessment.

Samples will be collected in depositional areas at the thickest sediment profile. Channel cross section will be surveyed at each sampling station and sediment depth will be measured at three (3) locations perpendicular to the channel (channel center and half way between channel center and right channel edge and half way between channel center and left channel edge).

Number of Sediment Samples	50	
Analyses	PCBs	Method 680
	TPH	Method 8015B
	Copper	Method 7211

	Zinc	Method 7951
	TOC	
	Grain Size	
	Solids Content	

Savannah Laboratories, which will perform the sediment analyses, does not have a procedure in their QAPP for analyzing zinc by AA. Savannah has all the necessary equipment to conduct this analysis but does not have the necessary lamp. This lamp will be obtained prior to start of sample analysis.

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

8.2 Extent of Industry-Specific Constituent Migration in Developed Areas

Vertically-integrated sediment core samples will be collected at 150 ft. intervals in Creek Segments C, D and E to determine the extent of downstream migration of constituents related to specific industrial sources located at the upstream end of Dead Creek (Figure 9). The combined length of these creek segments is approximately 7,000 ft.. Industry-specific constituents include PCBs (discontinued chemical manufacturing operation), Total Petroleum Hydrocarbons (closed oil refinery), Copper (active metal refining) and zinc (active metal refining). This information will also be used in the human health risk assessment.

Samples will be collected in depositional areas at the thickest sediment profile. Channel cross section will be surveyed at each sampling station and sediment depth will be measured at three (3) locations perpendicular to the channel (channel center and half way between channel center and right channel edge and half way between channel center and left channel edge).

Number of Sediment Samples	47	
Analyses	PCBs	Method 680
	TPH	Method 8015B
	Copper	Method 7211

Zinc	Method 7951
TOC	
Grain Size	
Solids Content	

Savannah Laboratories, which will perform the sediment analyses, does not have a procedure in their QAPP for analyzing zinc by AA. Savannah has all the necessary equipment to conduct this analysis but does not have the necessary lamp. This lamp will be obtained prior to start of sample analysis.

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

8.3 Extent of Industry-Specific Constituent Migration in the Borrow Pit Lake

Vertically-integrated sediment core samples will be collected at 400 ft. intervals from the upstream end of the borrow pit lake in Creek Segment F down to the confluence of Dead Creek with the lake in order to determine the distribution of constituents related to specific industrial sources located at the upstream end of Dead Creek (Figure 9). Industry-specific constituents include PCBs (discontinued chemical manufacturing operation), Total Petroleum Hydrocarbons (closed oil refinery), Copper (active metal refining) and zinc (active metal refining). This information will also be used in the human health risk assessment.

Samples will be collected along the center line of the lake. While sediment deposition is likely at the point where Dead Creek enters the Borrow Pit Lake, sediment transport north of the confluence will be limited by backwater depositional processes and streamflow into the north end of the lake.

Number of Sediment Samples	8	
Analyses	PCBs	Method 680
	TPH	Method 8015B
	Copper	Method 7211

Zinc	Method 7951
TOC	
Grain Size	
Solids Content	

Savannah Laboratories, which will perform the sediment analyses, does not have a procedure in their QAPP for analyzing zinc by AA. Savannah has all the necessary equipment to conduct this analysis but does not have the necessary lamp. This lamp will be obtained prior to start of sample analysis.

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

8.4 Extent of Site-Specific Constituent Migration in Dead Creek

Vertically-integrated sediment core samples will be collected every 1000 ft. in Dead Creek, from the upstream end of Creek Segment B to the downstream end of Creek Segment F at the Old Prairie du Pont Creek lift station, to determine the extent of downstream migration of TCL/TAL constituents (Figure 10). These broad-scan analyses are also intended to provide information for the human health and ecological risk assessments.

Two sediment core samples will be collected in the borrow pit lake in Creek Segment F upstream of the discharge of Dead Creek to assess the effect of backwater conditions and/or the contributions of other sources. One sample will be collected upstream and one sample will be collected downstream of the confluence of Dead Creek and Old Prairie du Pont Creek to determine the impact of the Dead Creek discharge on sediment quality in Old Prairie du Pont Creek.

The location of the upstream sample in Old Prairie du Pont Creek will be collected at an appropriate distance from the confluence with Dead Creek so that possible previous effects of flooding and flow reversals will not affect the collection of the background sample. As reported in the 1996 HRS package prepared by PRC Environmental Management, Inc. for USEPA, a

background sampling station was located 200 ft. north of the confluence of Dead Creek and Old Prairie du Pont Creek. The sediment background sample will be collected at this location.

Samples will be collected in depositional areas at the thickest sediment profile. Channel cross section will be surveyed at each sampling station and sediment depth will be measured at three (3) locations perpendicular to the channel (channel center and half way between channel center and right channel edge and half way between channel center and left channel edge.

Number of Sediment Samples	20	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290
	TOC	
	Grain Size	
	Solids Content	

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

9.0 Surface Water Sampling Plan

Surface water samples will be collected to determine the extent of downstream migration of site-related constituents and to provide information for use in the human health risk assessment (recreational teenager and recreational fishing scenarios) and the ecological risk assessment (endpoint organism exposure to surface water). The Human Health Risk Assessment Work Plan is in Volume 1B of the SSP and the Ecological Risk Assessment Work Plan is in Volume 1B.

9.1 Areas of Surface Water Contamination in Dead Creek and its Tributaries and Surrounding Wetland Areas

Surface water samples will be collected every 1000 ft. in Dead Creek, from the upstream end of Segment B to the downstream end of Segment F at the Old Prairie du Pont Creek lift station, to determine the extent of downstream migration of site-related constituents (Figure 10).

Two surface water samples will be collected in the borrow pit lake in Creek Segment F upstream of the discharge of Dead Creek to assess the effect of backwater conditions and/or the contributions of other sources. One sample will be collected upstream and one sample will be collected downstream of the confluence of Dead Creek and Old Prairie du Pont Creek to determine the impact of the Dead Creek discharge on surface water quality in Old Prairie du Pont Creek.

The location of the upstream sample in Old Prairie du Pont Creek will be collected at an appropriate distance from the confluence with Dead Creek so that possible previous effects of flooding and flow reversals will not affect the collection of the background sample. As reported in the 1996 HRS package prepared by PRC Environmental Management, Inc. for USEPA, a background sampling station was located 200 ft. north of the confluence of Dead Creek and Old Prairie du Pont Creek. The surface water background sample will be collected at this location.

Samples will be collected at a depth of 0.6 of the water column (measured from the top of the water column).

Number of Surface Water Samples	20	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010A
	Mercury	Method 7470A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290
	TSS	
	TDS	
	Hardness	
	pH	
	Fluoride	
	Total Phosphate	
	Orthophosphate	

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

10.0 Air Sampling Plan

Ambient air sampling will be conducted to determine the tendency of site constituents to enter the atmosphere and local wind patterns. Air sampling data will be used in the human health risk assessment (construction/utility worker and residential exposure scenarios). The Human Health Risk Assessment Work Plan is in Volume 1B of the SSP.

10.1 Tendency of Constituents to Enter the Atmosphere and Local Wind Patterns

10.1.1 Volatile Organics

24-hour cumulative duration sorbent tube samples will be collected on a warm, dry day using TO1 sampling protocols in order to determine the tendency of site constituents to enter the atmosphere and local wind patterns. Two upwind and two downwind sorbent tube samplers will be installed around Site G and three upwind and six downwind sorbent tube samplers will be installed at Sites H, I and L. All sampling locations will be selected in the field with the concurrence of the USEPA or its designee. Samples are not being collected at Site N because it is a construction debris disposal site.

Number of Volatile Organic Air Samples	13	
Analyses	VOCs	8260B

10.1.2 Semivolatile Organics, PCBs and Dioxins

24-hour cumulative duration PUF samples will be collected on a warm, dry day in order to determine the tendency of site constituents to enter the atmosphere and local wind patterns. Two upwind and two downwind PUF samplers will be installed around Site G and three upwind and six downwind PUF samplers will be installed at Sites H, I and L. All sampling locations will be selected in the field with the concurrence of the USEPA or its designee. Samples are not being collected at Site N because it is a construction debris disposal site.

Number of Organic Air Samples	13	
Analyses	SVOCs	TO-13
	PCBs	TO-4
	Dioxin	TO-9

10.1.3 Metals

24-hour cumulative duration PM 2.5 samples will be collected over a 7 day period in order to determine the tendency of site constituents to enter the atmosphere and local wind patterns. Two upwind and two downwind PM 2.5 samplers will be installed around Site G and three upwind and six downwind PM 2.5 samplers will be installed at Sites H, I and L. All sampling locations will be selected in the field with the concurrence of the USEPA or its designee. Samples are not being collected at Site N because it is a construction debris disposal site.

Number of Metals Air Samples	13	
Analyses	Metals	6010B

10.2 Degree of Hazard

All detected organic and inorganic constituents detected will be compiled into a data base. Frequency of detection, average, maximum, minimum and 95% confidence interval concentrations will be compiled for each detected constituent along with information on degree of hazard. This information will be used in the human health risk assessment. The Human Health Risk Assessment Work Plan is in Volume 1B of the SSP.

11.0 Ecological Assessment Sampling Plan

Data from the Ecological Assessment Sampling Plan will be used to evaluate the impact of site-related constituents on the following assessment endpoint organisms: large mouth bass, great blue heron, bald eagle, mallard duck, muskrat and river otter. The Ecological Risk Assessment Work Plan (Volume 1C of the SSP) and QAPP/FSP (Volume 3 of the SSP), describes how ecological sampling will be performed and how data will be used to assess impacts on assessment endpoint organisms.

VOC analysis is not included in the ecological assessment, except in the two reference areas, because VOC concentration in surface water and sediment is being determined as part of Sections 8.0 and 9.0 of the SSP, respectively. In addition, the benthic organism, vegetation, crawfish and fish samples are composites and VOC analyses can not be done on composites.

Fish sampling is focused on Creek Segment F because the Borrow Pit Lake at the southern end of this creek segment appears to be the best habitat area for fish and wildlife, it is most likely to be the primary depositional area for sediments transported from the upper reaches of Dead Creek and recreational fishing is most likely to occur at this location. Fish sampling is not proposed for Creek Segments B, C, D and E and the stream portion of Creek Segment F between Route 157 and the Borrow Pit Lake because these segments are essentially a storm water drainage channel in a densely settled area where streamflow is intermittent and habitat is limited. As directed by USACE, if fish are observed in Creek Segments B, C, D, E or the stream portion of F, one composite sample consisting of at least five forager fish will be prepared for each segment in which fish are found and analyzed for the following parameters:

Number of Composite Forager Fish Samples	5 (Whole Fish)	
Total Number of Analyses	5	
Analyses	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B

PCBs	Method 680
Pesticides	Method 8081A
Herbicides	Method 8151A
Dioxin	Method 8290

Fish will be sampled in areas with constituents that have a high bioaccumulation factor, e.g. PCBs, if data are available to identify these areas. If data are not available, fish will be collected over the entire length of the creek segment.

As directed by Weston, if crawfish are observed in Creek Segments B, C, D, E or the stream portion of F, one composite sample consisting of at least five crawfish will be prepared for each segment in which crawfish are found and analyzed for the following parameters:

Number of Composite Crawfish Samples	5 (Whole Crawfish)	
Total Number of Analyses	5	
Analyses	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290

Crawfish will be sampled in areas with constituents that have a high bioaccumulation factor, e.g. PCBs, if data are available to identify these areas. If data are not available, crawfish will be collected over the entire length of the creek segment.

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

Fish sampling stations in the Borrow Pit Lake will be co-located with sediment sampling stations.

11.1 Affected Ecosystem Description

A habitat assessment will be conducted by assembling information from published and public sources on wetlands, special habitats, cover types and areal extent, lists of vegetation and fauna (terrestrial and aquatic) present in the area and rare, threatened and endangered species lists. After assembling this information, a walk-through habitat assessment of the study area will be conducted over a three to five day period with the ultimate goal of confirming that the appropriate assessment endpoint organisms were selected for evaluation in the Ecological Risk Assessment. Simple maps showing areas of trees, riparian vegetation, dominant flora, etc. will be prepared during this walk through. Animals and birds present in the study area will be determined by direct observation of the animals, recording indirect evidence such as tracks, droppings, etc. and listening to or recording bird calls.

After performance of the habitat assessment, types of vegetation to be sampled and used in the Ecological Risk Assessment will be selected and submitted to the Agency for acceptance. Since bullrushes are used as a food source by both ducks (seeds) and muskrats (plant), it is likely that this will be the plant species selected for sampling and chemical analysis. Compositing of various plant species at a sampling location may also be done in order to provide inputs to the Ecological Risk Assessment. Compositing of benthic organisms may also need to be done to obtain enough mass for chemical analysis.

11.2 Evaluation of Toxicity in Creek Segments B, C, D and E

As directed by USACE, sediment samples will be collected at three locations in Creek Segments B, C, D and E. Sediment bioassay, benthic organism and vegetation samples will also be collected at these locations, as directed by IEPA, in order to evaluate the risks to endpoint organisms resulting from the presence of site-related constituents (Figure 11).

If samples are collected at the high, average and low copper concentration location in each creek segment as directed by Weston, ecological sampling can not be done until May/June 2000 and total project duration will increase by 8 months (Section 16.0). In order to complete the EE/CA in 19 months, ecological samples need to be collected in the upper, middle and

lower stretches of each creek segment during September/October 1999. Existing sediment quality data can be used to guide selection of these sampling locations.

Benthic community structure will be evaluated by collecting three sediment grab samples at each sampling station. A total of 36 benthic community structure evaluations will be done, one on each grab sample.

Number of Sediment Bioassays	12		
Number of Sediment Samples	12		
Analyses		VOCs	Method 8260B
		SVOCs	Method 8270C
		Metals	Method 6010B
		Mercury	Method 7471A
		Cyanide	Method 9010B
		PCBs	Method 680
		Pesticides	Method 8081A
		Herbicides	Method 8151A
		Dioxin	Method 8290
Number of Composite Benthic Organism Samples	4		
Number of Composite Vegetation Samples (Seeds/Stems)	12		
Number of Composite Vegetation Samples (Plant Roots)	12		
Total Number of Analyses	36		
Analyses		SVOCs	Method 8270C
		Metals	Method 6010B
		Mercury	Method 7471A
		Cyanide	Method 9010B
		PCBs	Method 680
		Pesticides	Method 8081A
		Herbicides	Method 8151A
		Dioxin	Method 8290

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee. Sediment samples from the high, average and low copper concentration locations of each creek segment will be composited to provide sufficient benthic organism tissue mass for chemical analyses if the 26 month schedule is followed. Sediment samples from the upper,

middle and lower portions of each creek segment will be composited to provide sufficient benthic organism tissue mass for chemical analysis if the 19 month schedule is followed.

11.3 Evaluation of Toxicity in Site M Sediments

As directed by Weston, sediment bioassay, benthic organism and vegetation samples will also be collected at one location in Site M in order to evaluate the risks to endpoint organisms resulting from the presence of site-related constituents. Samples will be collected at one of the four sediment sampling locations (Section 5.2 and Figure 4). Benthic community structure will be evaluated by collecting three sediment grab samples at the sampling station. A total of three benthic community structure evaluations will be done, one on each grab sample.

Number of Sediment Bioassays	1	
Number of Sediment Samples	1	
Number of Composite Benthic Organism Samples	1	
Number of Composite Vegetation Samples (Seeds/Stems)	1	
Number of Composite Vegetation Samples (Plant Roots)	1	
Total Number of Analyses	4	
Analyses	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290

All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

11.4 Evaluation of Toxicity in Creek Segment F

Sediment bioassay, benthic organism and vegetation samples will be collected at three locations in the stream portion of Creek Segment F between Route 157 and the Borrow Pit Lake (Figure 11) as directed by IEPA.

If samples are collected at the high, average and low copper concentration location in each creek segment as directed by Weston, ecological sampling can not be done until May/June 2000 and total project duration will increase by 8 months (Section 16.0). In order to complete the EE/CA in 19 months, ecological samples need to be collected in the upper, middle and lower stretches of each creek segment during September/October 1999. Existing sediment quality data can be used to guide selection of these sampling locations.

Benthic community structure will be evaluated by collecting three sediment grab samples at each sampling station. A total of nine benthic community structure evaluations will be done, one on each grab sample.

Number of Sediment Bioassays	3	
Number of Sediment Samples	3	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290
Number of Composite Benthic Organism Samples	1	
Number of Composite Vegetation Samples (Seeds/Stems)	3	
Number of Composite Vegetation Samples (Plant Roots)	3	
Total Number of Analyses	7	
Analyses	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A

Cyanide	Method 9010B
PCBs	Method 680
Pesticides	Method 8081A
Herbicides	Method 8151A
Dioxin	Method 8290

Sediment samples from the high, average and low copper concentration locations of each creek segment will be composited to provide sufficient benthic organism tissue mass for chemical analyses if the 26 month schedule is followed. Sediment samples from the upper, middle and lower portions of each creek segment will be composited to provide sufficient benthic organism tissue mass for chemical analysis if the 19 month schedule is followed.

Sediment bioassay, benthic organism, vegetation, crawfish and fish samples will be collected at three locations in the Creek Segment F Borrow Pit Lake to evaluate the risks to endpoint organisms resulting from the presence of site-related constituents (Figure 11). One sampling station will be located upstream of the discharge of Dead Creek, one sampling station will be located near the discharge of Dead Creek and one sampling station will be located downstream of the discharge of Dead Creek. Benthic community structure will be evaluated at each sampling station, a total of three benthic community structure evaluations. Biological sampling stations will be collected with sediment sampling stations (Section 8.4). Large mouth bass will be sampled in the Borrow Pit Lake in order to provide fillet information for the human health risk assessment (recreational fishing exposure pathway). If large mouth bass are nolt present or present in insufficient quantities, other game fish such as crappie will be collected in order to obtain the fillet samples needed for the Human Health Risk Assessment. Each composite fish and crawfish sample will include at least five individual organisms.

Number of Sediment Bioassays	3
Number of Sediment Samples	3
Number of Benthic Organism Samples	3
Number of Composite Vegetation Samples (Seeds/Stems)	3
Number of Composite Vegetation Samples (Plant Roots)	3
Number of Composite Crawfish Samples	3
Number of Composite Small Forager Fish Samples	3 (Whole Body)
Number of Composite Medium Bottom Feeder Fish Samples	3 (Whole Body)

Number of Composite Large Predator Fish Samples	3 (Whole Body)	
Number of Composite Game Fish Samples	3 (Fillet)	
Total Number of Analyses	27	
Analyses	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290

Each composite fish tissue sample will be analyzed for lipids. All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

11.5 Evaluation of Toxicity in the Reference Area

Surface water, sediment, sediment bioassay, benthic organism, vegetation, crawfish and fish tissue samples will be collected in two reference areas in the Dead Creek watershed, or in a watershed that includes industrial, commercial, residential and farming land uses comparable to that in the Dead Creek watershed, in order to provide a basis for comparison with the Dead Creek ecological assessment samples. One reference area will represent flowing water and the other reference area will represent still water. The reference areas will be either Old Prairie du Pont Creek upstream of its confluence with Dead Creek or Harding Ditch upstream of its confluence with Old Prairie du Pont Creek. A qualified wildlife biologist will conduct a qualitative evaluation of these potential reference area locations and identify the reference areas with habitats most similar to those of Dead Creek. Results of this reference area evaluation and selection effort will be summarized in a letter report and submitted to the Agency for acceptance. Ecological sampling at all locations will be performed after Agency acceptance of the proposed reference area.

Surface water, sediment, sediment bioassay, benthic organism, vegetation, crawfish and fish tissue samples will be collected at two locations in each reference area. Benthic community

structure will be evaluated by collecting three sediment grab samples at each sampling station. A total of 12 benthic community structure evaluations will be done, one on each grab sample. Each composite fish and crawfish samples will include at least five individual organisms.

Number of Sediment Bioassays	4	
Number of Surface Water Samples	4	
Number of Sediment Samples	4	
Total Number of Analyses	8	
Analyses	VOCs	Method 8260B
	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290
Number of Benthic Organism Samples	4	
Number of Composite Vegetation Samples (Seeds/Stems)	4	
Number of Composite Vegetation Samples (Plant Roots)	4	
Number of Composite Crawfish Samples	4	
Number of Composite Small Forager Fish Samples	4 (Whole Body)	
Number of Composite Medium Bottom Feeder Fish Samples	4 (Whole Body)	
Number of Composite Large Predator Fish Samples	4 (Whole Body)	
Number of Composite Game Fish Samples	4 (Fillet)	
Total Number of Analyses	32	
Analyses	SVOCs	Method 8270C
	Metals	Method 6010B
	Mercury	Method 7471A
	Cyanide	Method 9010B
	PCBs	Method 680
	Pesticides	Method 8081A
	Herbicides	Method 8151A
	Dioxin	Method 8290

Each fish tissue sample will be analyzed for lipids. All sampling locations will be selected in the field with the concurrence of the USEPA or its designee.

11.6 Assessment of Endpoint Organisms

Information from Creek Segments B, C, D, E and F will be used to perform an Ecological Risk Assessment (Volume 1C of the SSP). The benthic macroinvertebrate community, a warm water fish (largemouth bass), two fish-eating birds (great blue heron and the bald eagle), a vegetation and benthic macroinvertebrate-eating bird (mallard duck), a fish-eating mammal (river otter) and a vegetation-eating mammal (muskrat) will be used as assessment endpoints for the Ecological Risk Assessment.

The river otter was selected as the fish-eating mammal endpoint organism because this animal represents a top piscivorous carnivore and the worst case situation will respect to using fish and other aquatic life as a food source. While mink are well studied, the river otter is believed to "... have similar sensitivity to organochlorines as mink." (Wren, C.D., Cause-Effect Linkages Between Chemicals and Populations of Mink (Mustela vison) and Otter (Lutra canadensis) in the Great Lakes Basin, J. of Tox. And Envir. Health, 33:549-585, 1991). Since the otter has a greater reliance on fish and other aquatic organisms as a food source, and has a sensitivity to organochlorines similar to the mink, it is a better choice for the evaluation of ecological risks in the habitat found at Dead Creek.

11.7 Exposure Pathways

See Volume 1C Ecological Risk Assessment Work Plan.

11.8 Toxicity Testing or Trapping

See Volume 3 Ecological Risk Assessment QAPP and FSP.

12.0 Pilot Treatability Test Sampling Plan

Treatability pilot tests will be conducted on wastes and sediments in order to identify any characteristics of these materials that would prevent their treatment using off-site incineration or on-site thermal desorption.

Stabilization treatability pilot tests will be conducted to determine the appropriate mix of stabilizing agents needed to reduce metals and organics leaching.

Leachate treatability pilot testing will be done to determine the appropriate combination of physical/chemical and/or biological treatment processes that are needed to achieve pretreatment requirements for discharge to the American Bottoms POTW. Leachate from Sites G and I is considered representative of leachate found in the fill areas.

12.1 Off-Site Waste Incineration Pilot Treatability Tests

One composite organic waste sample will be made from the waste samples collected from the waste characterization borings installed at fill each area (Sites G, H, I, L and N). Individual aliquots of this sample will be sent to four RCRA/TSCA-permitted, fixed-facility incinerators for waste profiling, material handling characterization and evaluation of the feasibility of disposing of the waste material by off-site incineration. Current plans call for sending two aliquots to the SafetyKleen facilities at Deer Park, Texas and Coffeyville, Kansas or to a testing location designated by SafetyKleen. SafetyKleen in Coffeyville, Kansas is the only incineration facility permitted to accept dioxin-containing materials from RCRA-listed processes. Two aliquots will be sent to the Waste Management incinerators at Sauget, Illinois and Port Arthur, Texas or to a testing facility designated by Waste Management. These four facilities are the fixed-facility hazardous waste incinerators closest to Sauget Area 1.

12.2 On-Site Waste Thermal Desorption Pilot Treatability Tests

One composite organic waste sample will be made from the waste samples collected from the waste characterization borings installed at each fill area (Sites G, H, I, L and N). Aliquots of this sample will be sent to three RCRA/TSCA-permitted thermal desorption contractors for waste profiling, material handling characterization and evaluation of the feasibility of treating the waste material by thermal desorption. Consolidations and bankruptcies in the environmental services market make it unclear who has mobile thermal desorption equipment permitted to handle PCBs and dioxin. In the past, Canonie, McLaren/Hart, SRS and Weston had thermal desorbers designed to operate in a low-oxygen or oxygen-free mode. Research will be done to determine who is still in the pyrolitic thermal desorption business and who has a nation-wide permit to handle PCB and dioxin-containing materials. Contractors will be identified to the Agency 30 days before the pilot test samples are shipped.

12.3 On-Site Sediment Thermal Desorption Pilot Treatability Tests

Sediment samples will be collected every 200 ft. in Creek Segment B and at 10 locations in Site M to create one composite sediment sample to be used in the sediment on-site thermal desorption pilot treatability testing. Aliquots of this sample will be sent to three RCRA/TSCA-permitted thermal desorption contractors for waste profiling, material handling characterization and evaluation of the feasibility of treating the waste material by thermal desorption. Consolidations and bankruptcies in the environmental services market make it unclear who has mobile thermal desorption equipment permitted to handle PCBs and dioxin. In the past, Canonie, McLaren/Hart, SRS and Weston had thermal desorbers designed to operate in a low-oxygen or oxygen-free mode. Research will be done to determine who is still in the pyrolitic thermal desorption business and who has a nation-wide permit to handle PCB and dioxin-containing materials. Contractors will be identified to the Agency 30 days before the pilot test samples are shipped

12.4 Sediment Stabilization Pilot Treatability Tests

One sediment sample will be collected at the sampling station with the highest detected organic concentrations and one sediment sample will be collected at the sampling station with

the highest detected metal concentrations. Stabilization mix testing treatability pilot tests will be conducted on the two samples to determine stabilant mixes that will: 1) solidify sediments to pass the paint filter test, 2) solidify sediments to a bearing capacity of 2000 pounds per square foot and/or 3) reduce metals or organics leaching. Stabilization mix testing will be done by Kiber Environmental Services, Atlanta, Georgia.

12.5 Leachate Treatment Pilot Treatability Tests

Leachate treatability pilot tests will be conducted on samples collected from Sites G and I to determine if pretreatment limits can be achieved prior to discharge to the American Bottoms POTW. One leachate sample will be collected from Site I and one leachate sample will be collected from Site G using the 2-inch diameter well installed at each of these fill areas as part of the Waste Characterization Sampling Plan. As required by USACE, these wells will be stressed so that a representative leachate sample can be collected. Pumping will be limited by constraints imposed by leachate storage and disposal requirements. Pilot treatability testing will be conducted by the Advent Group, Brentwood, Tennessee.

13.0 Support Sampling Plan Data Report

The Support Sampling Plan Data Report, in table-form with corresponding figures, will be provided to USEPA and IEPA. This report will summarize the sampling results from the EE/CA and RI/FS Support Sampling. The results of all pilot treatability tests will be included in the Data Report. If requested by USEPA, copies of all raw data will be provided.

All data resulting from chemical analysis of samples collected as part of this SSP will be submitted to the Agency in an Excell-compatible electronic spread sheet that includes the following information:

- latitude in decimal degrees
- longitude in decimal degrees
- sample identification number
- sample matrix (soil, groundwater, surface water, sediment, air)
- sample depth
- time and date of sample collection
- time and date of sample analysis
- chemical parameters
- analytical results
- analysis method
- detection limit
- measurement units (ppm, ppb, mg/kg, etc.)
- analytical result qualifiers (non-detect, etc.)

14.0 EE/CA and RI/FS Reports

The EE/CA and RI/FS Reports will be prepared as required by the AOC and by applicable guidance. Guidance to be used in preparing the EE/CA report is "Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA". Guidance to be used in preparing the RI/FS report is "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA". Work plans for the EE/CA Report and the RI/FS Report are included in Volume 1D and 1E of the Support Sampling Plan.

15.0 Project Team Organization

Solutia has assembled a skilled and experienced project team to conduct the Support Sampling Plan and prepare the Support Sampling Plan Data Report, the Human Health Risk Assessment (HHRA), the Ecological Risk Assessment (ERA) and the EE/CA and RI/FS Reports. This team approach brings a wide diversity of experience and knowledge to the project. Solutia will lead and manage the project team to implement the studies called for in the AOC SOW.

Principal members of the Support Sampling Team (SST) and their roles are described below.

Mike Light and Bruce Yare of Solutia are the leadership team for this project. Mr. Light will be the Project Coordinator and will be responsible for overall project quality and schedule. He will be the primary contact for the project.

Mr. Yare will be responsible to technical project quality and will be the Project Manager for the data interpretation portions of the project such as the Support Sampling Plan Data Report, HHRA, ERA and EE/CA and RI/FS Reports. Mr. Yare will also be responsible for insuring the efficient transfer of soil, groundwater, surface water, sediment and air sampling and analysis information from the data collection contractor, O'Brien & Gere, to the data interpretation contractor, Roux Associates. Regular project meetings will be held with Dean Palmer of O'Brien & Gere and John Loper of Roux Associates during the data collection and data interpretation activities in order to insure smooth integration of the two functions and facilitate preparation of the EE/CA Report and RI/FS Report.

Kimberly Perry, also of Solutia, will be the Project Manager for field data collection activities.

Dean Palmer of O'Brien & Gere is responsible for the team collecting the soil, surface water, sediment and air samples and preparing the Support Sampling Plan Data Report. Lisa Bradley of ENSR is responsible for leading the team that will prepare the Human Health Risk Assessment. Charlie Menzie and Jerry Cura of Menzie•Cura & Associates are responsible for

the team collecting the ecological samples and preparing the Ecological Risk Assessment. Betsy Beauchamp of Savannah Laboratories is responsible for laboratory analyses. Kathy Blaine of Environmental Standards is responsible for data validation. John Loper of Roux Associates is responsible for leading the team that will prepare the EE/CA and RI/FS Reports.

Mr. David E. Haverdink of O'Brien & Gere will be the Site Safety and Health Coordinator for the soil, groundwater, surface water, sediment and air sample collecting activities. Menzie•Cura has not yet identified its Site Safety and Health Coordinator for ecological sample collection. This person will be identified to the Agency within 30 days of submittal of this SSP.

Ms. Karen Stone of O'Brien & Gere will be the QA Officer for the soil, groundwater, surface water, sediment and air sample collection and analysis. Dr. Nancy C. Rothman will be the QA Officer for organic sample collection and analysis and Ms. Susan D. Chapnick will be the QA Officer for inorganic sample collection and analysis for samples collected as part of the ecological sampling program included in this SSP.

Internal peer review of the Human Health Risk Assessment and Ecological Risk Assessment will be provided by Solutia employees Drs. James Sherman and Gerald Coyle, respectively. External peer review will be provided by Jon Dikinis of Montgomery Watson and Rich Bartelt of Arcadis Geraghty & Miller.

Technical expertise on natural attenuation will be provided by Dr. Charles Newell of Groundwater Services.

Solutia understands that the USEPA is responsible for the Community Relations Plan (CRP) required by the NCP and that the Agency will take the lead in community relations and public participation activities. Solutia intends to support the Agency's community relations and public participation efforts and will participate as appropriate. Solutia will also facilitate meaningful public participation through the documents that it produces. Solutia anticipates that whatever CRP the USEPA provides will be NCP compliant and thus meet any obligations Solutia may have relative to subsequent cost recovery actions that Solutia may pursue.

16.0 Schedule

16.1 19 Month Schedule

The June 25, 1999 SSP contained a 19 month project schedule (Section 16.0) that consisted of one month startup/mobilization plus 18 months of project work. An 19 month project duration is dependent on collecting ecological samples at depositional areas in the upper, middle and lower stretches of each creek segment during September and October 1999.

Major project elements of the 19 month schedule, and their duration, are given below:

Project Start Up/ Mobilization	1 Month
Waste, Groundwater, Soil, Sediment, Surface Water, Air and Ecological Sample Collection, Analysis and Data Validation	11 Months
Data Report, Human Health Risk Assessment and Ecological Risk Assessment	4 Months
Engineering Evaluation/Cost Assessment Report	2 Months
Remedial Investigation/Feasibility Study	1 Month
Total Project Duration	19 Months

A 19 month bar chart schedule is included at the end of this section. Note that the RI/FS Report will be prepared concurrently with the EE/CA Report. The AOC allows 60 days for preparation of the EE/CA Report and 90 days for preparation of the RI/FS Report.

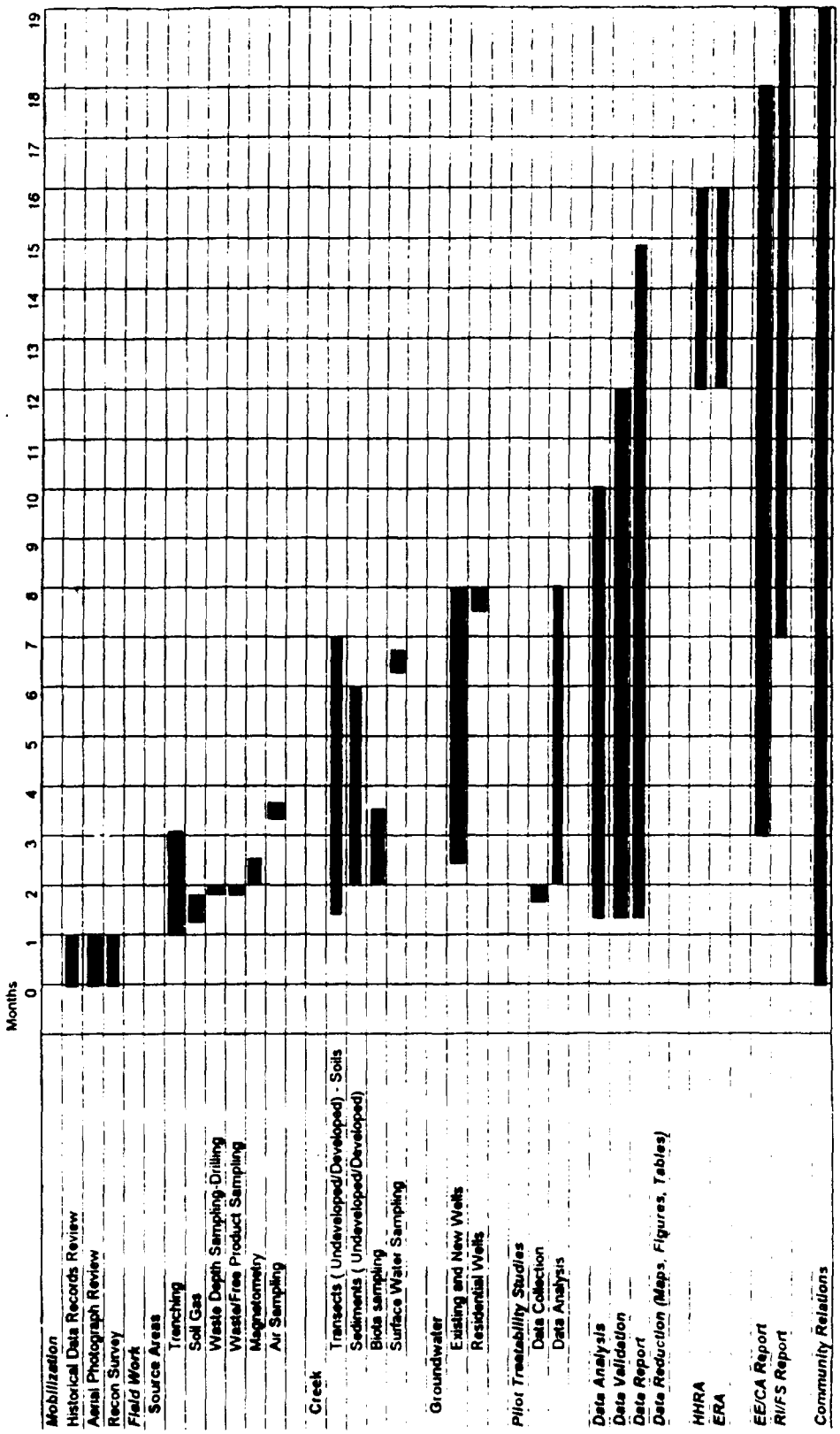
16.2 26 Month Schedule

If ecological samples are collected at the high, average and low copper concentration locations in each creek segment, as directed by Weston on July 27, 1999, ecological sample collection can not be done until: 1) sediment samples are collected, analyzed, validated and compiled, 2) discussions are held with the Agency to determine the appropriate concentration-based sampling locations and 3) aquatic vegetation is fully emergent. Sediment sampling will start in October 1999 and sample analysis, validation and compilation will finish by the end of January 2000 if the Agency approves the SSP during the week of August 16, 1999. The next ecological sampling window after the January 2000 completion of sediment sampling, analysis, validation and compilation is May/June 2000 when aquatic vegetation will be fully emergent. Collecting ecological samples in May/June 2000 will extend project duration by 8 months and result in a total project schedule of 26 months.

Major project elements of the 26 month schedule, and their duration, are given below:

Project Start Up/ Mobilization	1 Month
Waste, Groundwater, Soil, Sediment, Surface Water, Air and Ecological Sample Collection, Analysis and Data Validation; Data Report and Human Health Risk Assessment	18 Months
Ecological Risk Assessment	4 Months
Engineering Evaluation/Cost Assessment Report	2 Months
Remedial Investigation/Feasibility Study	1 Month
Total Project Duration	26 Months

A 26 month bar chart schedule is included at the end of this section.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19
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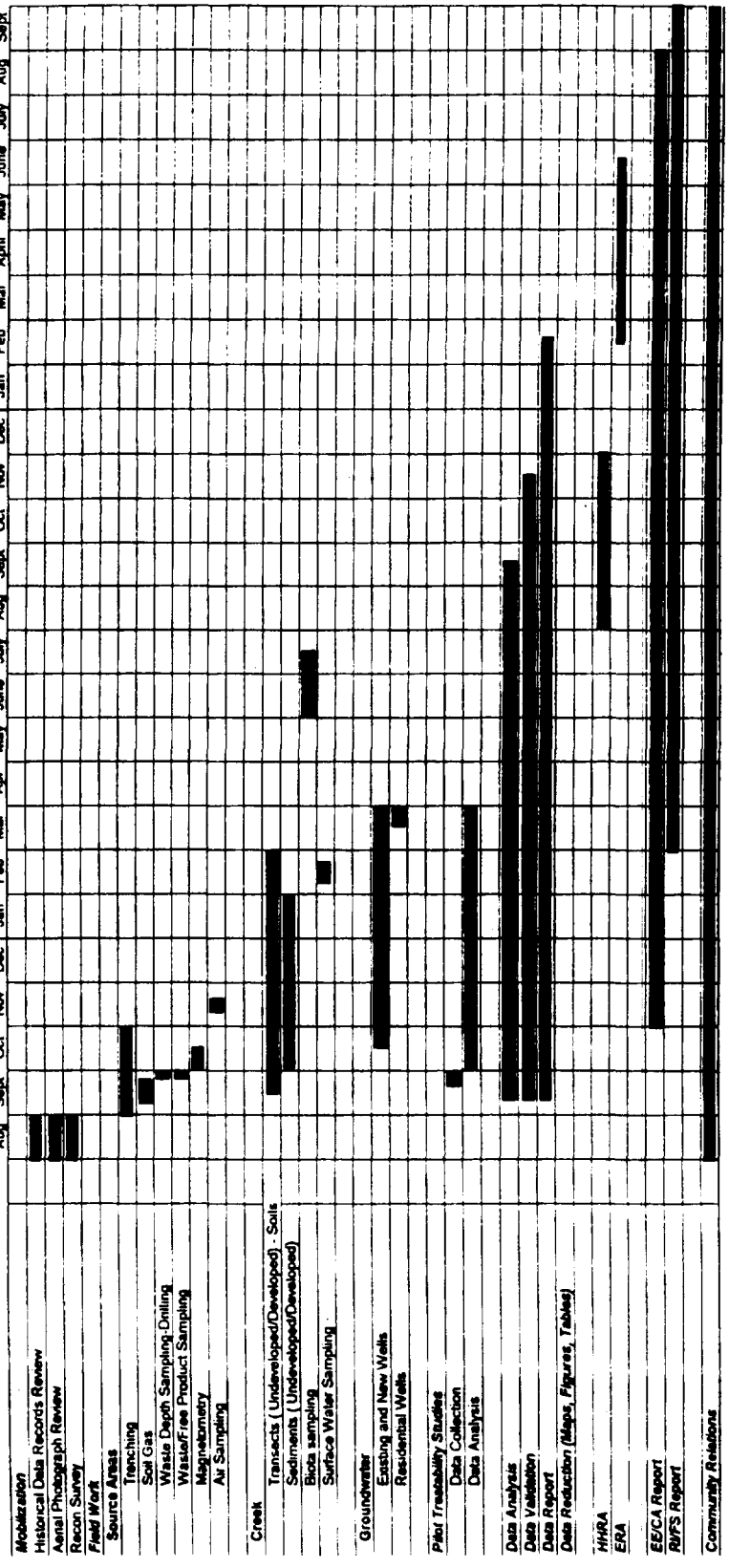
Historical Data Records Review
Aerial Photograph Review
Recon Survey
Field Work
Source Areas
Trenching
Soil Gas
Waste Depth Sampling-Drilling
Waste/Free Product Sampling
Magnetometry
Air Sampling
Creek
Transects (Undeveloped/Developed) - Soils
Sediments (Undeveloped/Developed)
Biota sampling
Surface Water Sampling
Groundwater
Existing and New Wells
Residential Wells
Pilot Treatability Studies
Data Collection
Data Analysis
Data Analysis
Data Validation
Data Report
Data Reduction (Maps, Figures, Tables)
HHRA
ERA
EE/CA Report
RI/FS Report
Community Relations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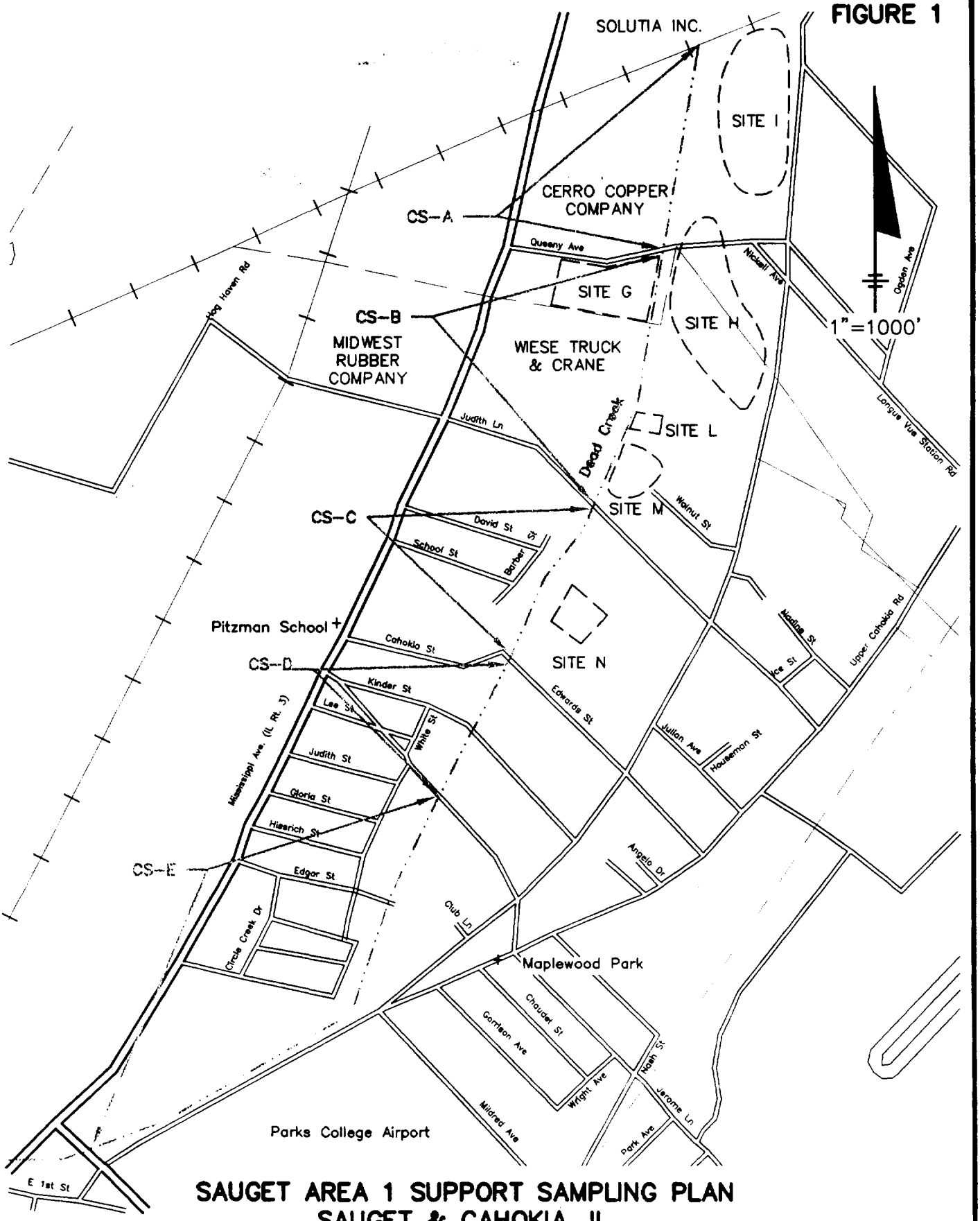
Mobilization
Historical Data Records Review
Aerial Photograph Review
Recon Survey
Field Work
Source Areas
Trenching
Soil Gas
Waste Depth Sampling-Drilling
Waste/Free Product Sampling
Magnetometry
Air Sampling
Creek
Transects (Undeveloped/Developed) - Soils
Sediments (Undeveloped/Developed)
Biota sampling
Surface Water Sampling
Groundwater
Existing and New Wells
Residential Wells
Pilot Treatability Studies
Data Collection
Data Analysis
Data Analysis
Data Validation
Data Report
Data Reduction (Maps, Figures, Tables)
HHRA
ERA
EE/CA Report
RI/FS Report
Community Relations

Figures

FIGURE 1



SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET & CAHOKIA, IL

FILL AREA & CREEK SECTOR LOCATION MAP

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O'BRIEN & GERE ENGINEERS INC.

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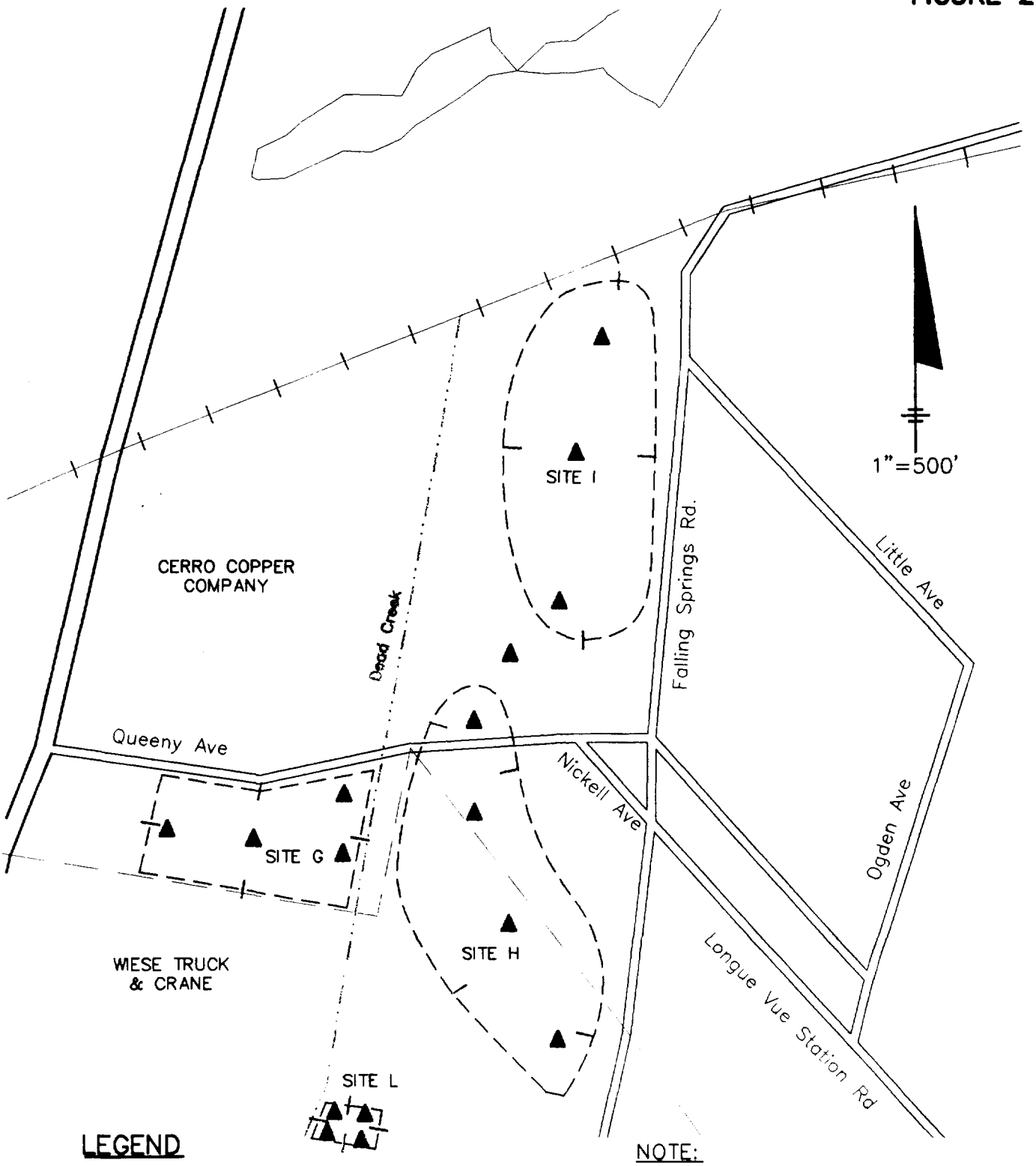
FIGURE 2



LEGEND

— BOUNDARY CONFIRMATION TRENCH

▲ WASTE CHARACTERIZATION BORING

NOTE:

1. TRENCH AND BORING LOCATIONS WILL BE FINALIZED AFTER COMPLETING AIR PHOTO ANALYSIS OF THE FILL AREAS.

SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET & CAHOKIA, IL

PRELIMINARY BOUNDARY CONFIRMATION TRENCH & WASTE CHARACTERIZATION BORING LOCATIONS AT SITES G, H, I & L

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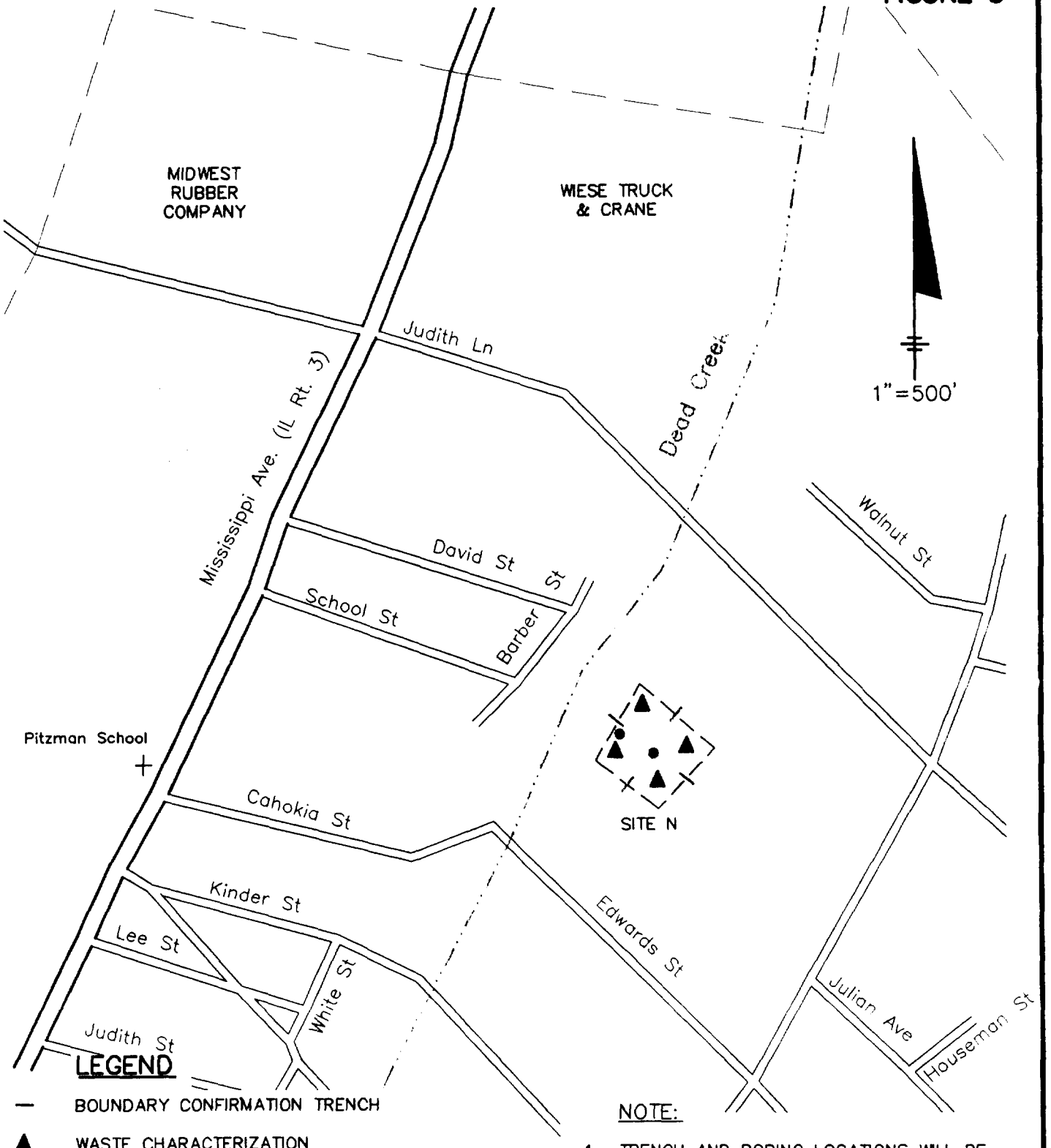
FIGURE 3



LEGEND

— BOUNDARY CONFIRMATION TRENCH

▲ WASTE CHARACTERIZATION BORING

● SUBSURFACE SOIL SAMPLE LOCATION

NOTE:

1. TRENCH AND BORING LOCATIONS WILL BE FINALIZED AFTER COMPLETING AIR PHOTO ANALYSIS OF THE FILL AREAS.

SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET AND CAHOKIA, IL

PRELIMINARY BOUNDARY CONFIRMATION TRENCH & WASTE CHARACTERIZATION BORING LOCATIONS AT SITE N

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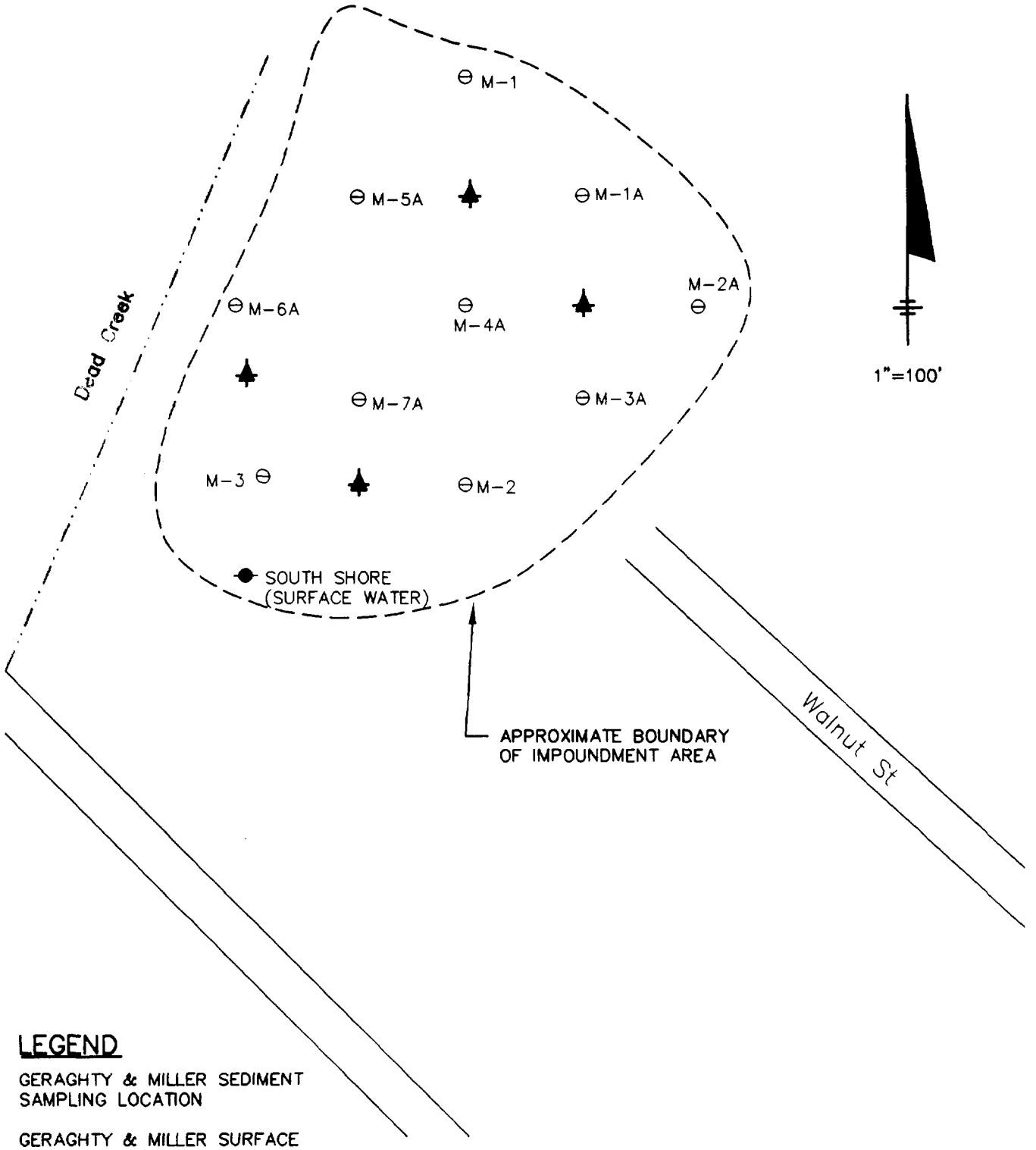
FIGURE 4



LEGEND

- ⊖ GERAGHTY & MILLER SEDIMENT SAMPLING LOCATION
- ● GERAGHTY & MILLER SURFACE WATER SAMPLING LOCATION
- ▲ SSP WASTE CHARACTERIZATION SAMPLING LOCATION

SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET AND CAHOKIA, IL

PRELIMINARY WASTE CHARACTERIZATION SAMPLING LOCATIONS AT SITE M

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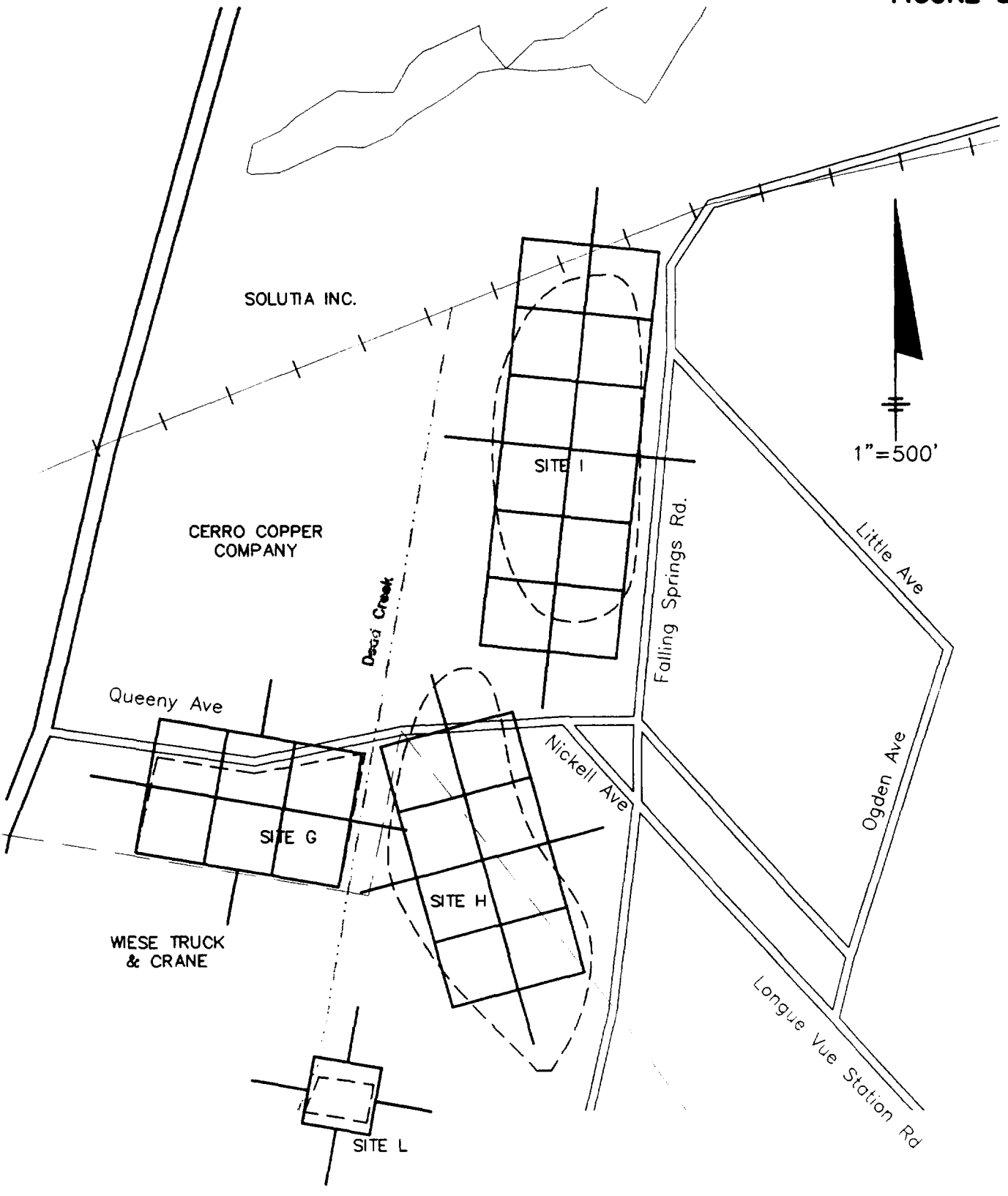
FIGURE 5



SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET & CAHOKIA, IL

SOIL GAS SURVEY SAMPLING GRID AT SITES G, H, I & L

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SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET AND CAHOKIA, IL

SOIL GAS SURVEY SAMPLING GRID AT SITE N

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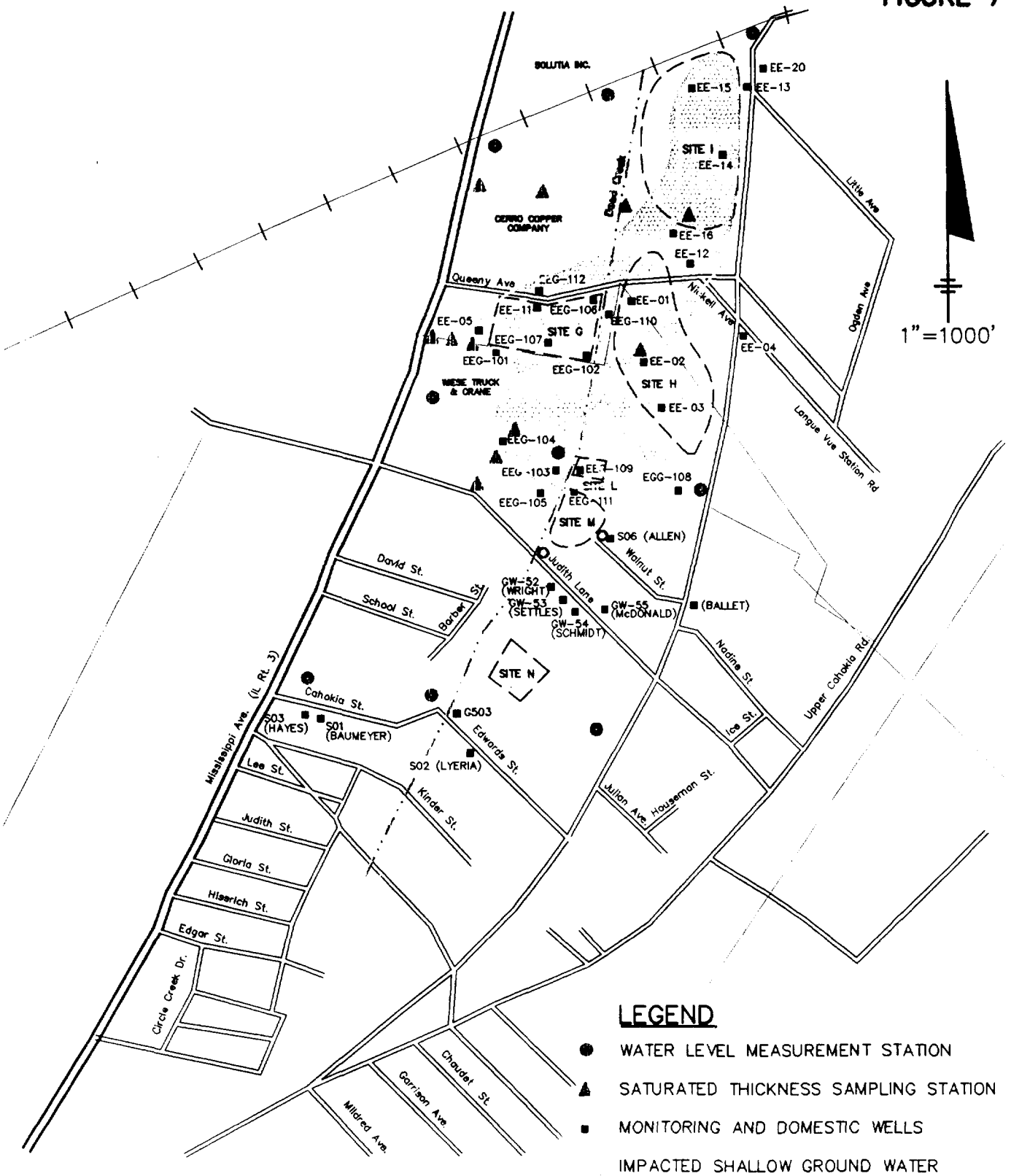
FIGURE 7



LEGEND

- WATER LEVEL MEASUREMENT STATION
- SATURATED THICKNESS SAMPLING STATION
- MONITORING AND DOMESTIC WELLS
- IMPACTED SHALLOW GROUND WATER
- SHALLOW GROUND WATER SAMPLING STATION

SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET & CAHOKIA, IL

GROUND WATER SAMPLING LOCATIONS

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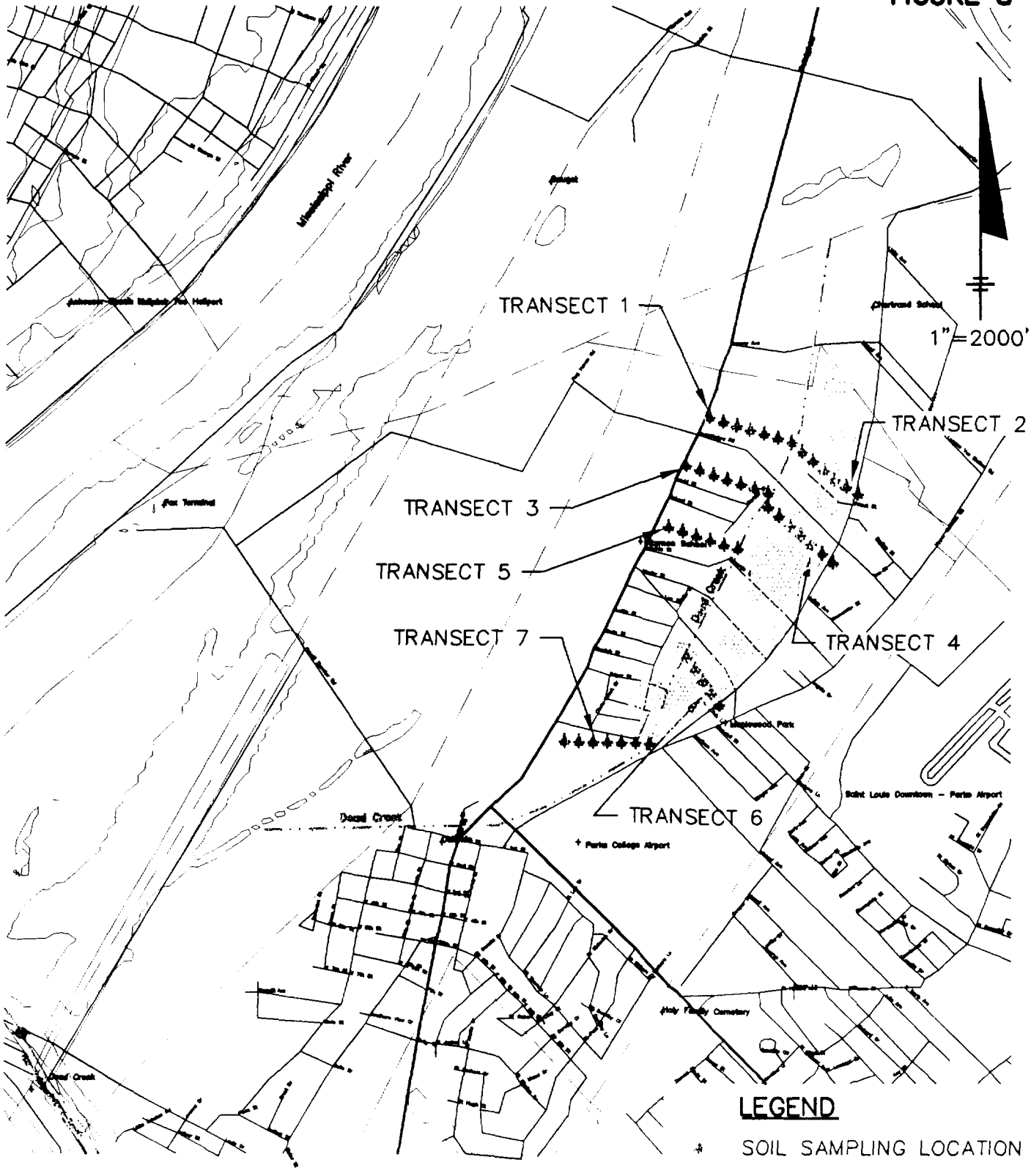
FIGURE 8



SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET AND CAHOKIA, IL

SOIL SAMPLING LOCATIONS

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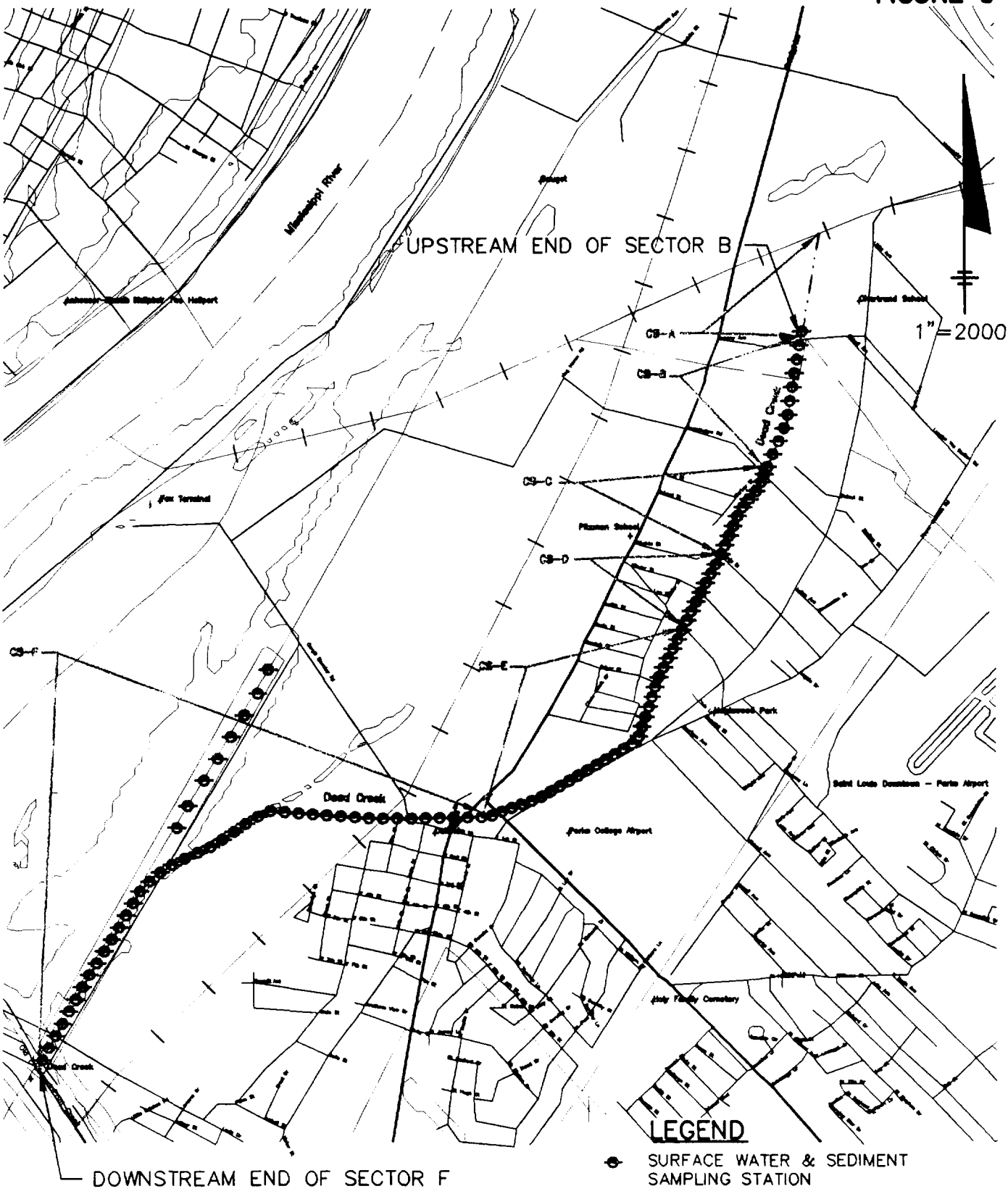
FIGURE 9



SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET AND CAHOKIA, IL

SURFACE WATER & SEDIMENT SAMPLING LOCATIONS
INDUSTRY-SPECIFIC CONSTITUENT MIGRATION

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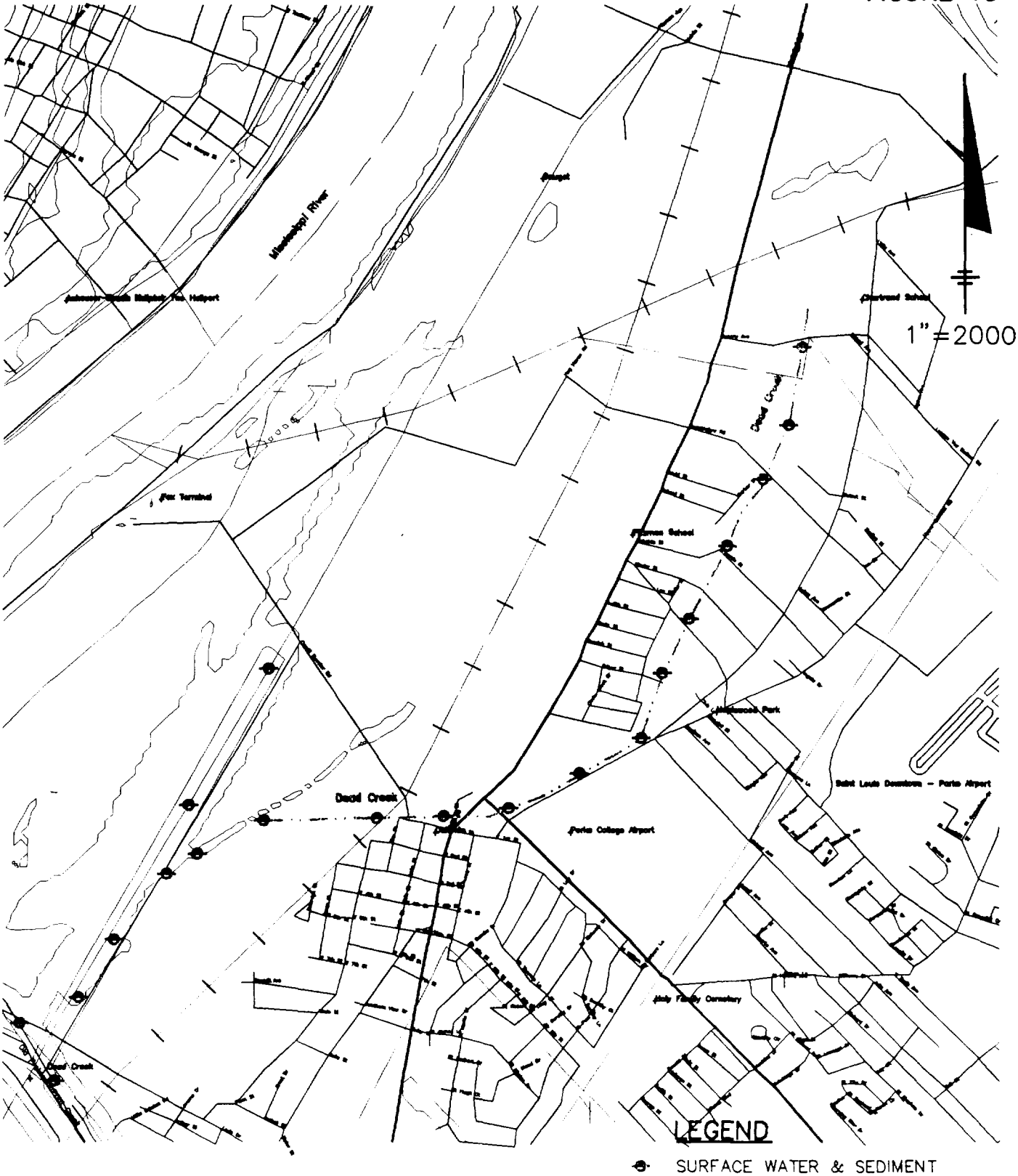
FIGURE 10



SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET AND CAHOKIA, IL

SURFACE WATER & SEDIMENT SAMPLING LOCATIONS
SITE-SPECIFIC CONSTITUENT MIGRATION

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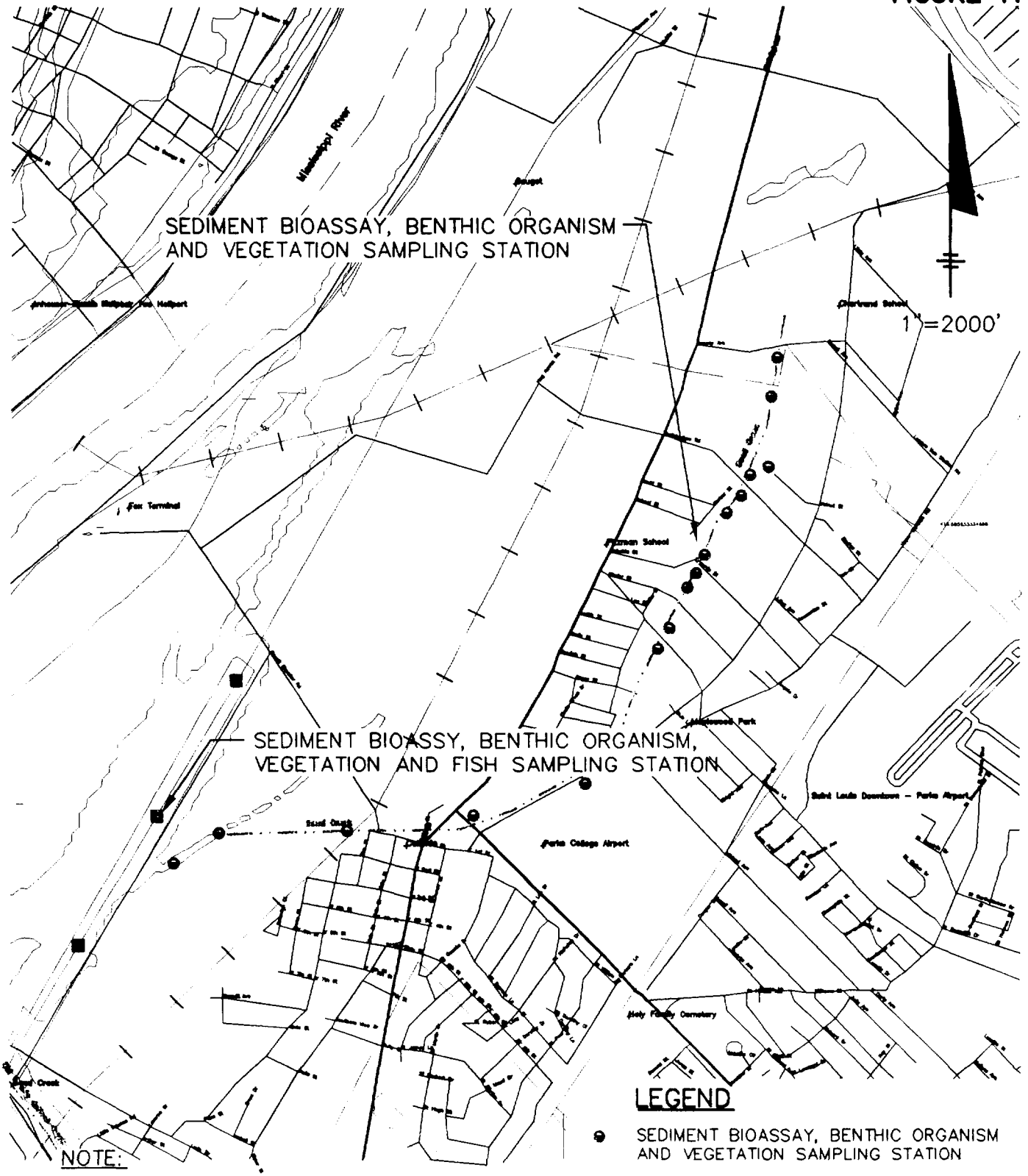
FIGURE 11



NOTE:
REFERENCE AREA 1 AND 2 NOT SHOWN ON FIGURE.

LEGEND

- ● SEDIMENT BIOASSAY, BENTHIC ORGANISM AND VEGETATION SAMPLING STATION
- ■ SEDIMENT BIOASSY, BENTHIC ORGANISM, VEGETATION AND FISH SAMPLING STATION

SAUGET AREA 1 SUPPORT SAMPLING PLAN
SAUGET AND CAHOKIA, IL

ECOLOGICAL SAMPLING LOCATIONS

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PLOT DATE: 3

Appendix A

Preliminary Ecological Risk Assessment

Sauget Area 1, Creek Segment F

PRELIMINARY ECOLOGICAL RISK ASSESSMENT
FOR
SAUGET AREA 1, CREEK SEGMENT F
SAUGET, ST. CLAIR COUNTY, ILLINOIS
TDD: S05-9703-012
PAN: 7M1201SI

August 31, 1997

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Emergency and Enforcement Response Branch
77 West Jackson Boulevard
Chicago, Illinois, 60604

Prepared by: Damon M Sinars Date: 8/29/97
Damon Sinars, START Project Manager

Reviewed by: for Date: 8/29/97
Mary Jane Ripp, Assistant START Program Manager

Approved by: for Date: 8/29/97
Thomas Kouris, START Program Manager

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International Specialists in the Environment

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Tel. 312/578-9243, Fax: 312/578-9345

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1. Introduction

The Ecology and Environment, Inc. (E & E), Superfund Technical Assessment and Response Team (START) was tasked by the United States Environmental Protection Agency (U.S. EPA) to prepare a screening-level ecological assessment for the Sauget Area 1, Creek Segment F site (the site) under the Superfund Removal Program Technical Direction Document S05-9703-012.

The following report summarizes preliminary findings regarding potential ecological risk at the site. This screening-level ecological assessment is based on information gathered during a site visit on April 18, 1997. The objective of this report is to determine whether the site poses no immediate or long-term ecological risk, or if a potential ecological risk exists and further evaluation is necessary.

2. Problem Formulation

2.1 Environmental Setting

2.1.1 Site Description

The site is a periodically flooded wetland, approximately 1 mile long. It is located in west-central St. Clair County, Illinois, directly across the Mississippi River from St. Louis, Missouri (Figure 2-1). The site is a drainage area for Dead Creek, which is an intermittent stream flowing south-southwest. Contaminated runoff that flows into Dead Creek may be deposited into the site. In order to isolate severe contamination, Dead Creek was blocked at Judith Lane, approximately 2 miles upstream from the site. Currently, a culvert exists at Judith Lane to allow flow during high water events. The creek then flows through the town of Cahokia, through a series of culverts, and enters the site area. Surface water leaves the site by outletting into the Prairie du Pont Floodway, then into the Cahokia Chute of the Mississippi River. The site is located immediately east of a United States Army Corps of Engineers flood control levee. The width of the flowing water on site varies with the season. The current assessment was conducted in April, during a relatively wet time of the year.

The land use surrounding the site and Dead Creek is a mix of industrial, agricultural, residential, and commercial. The nearby industrial areas consist of former municipal and industrial waste landfills, and excavation pits containing unknown industrial wastes. Several sites in the area have been investigated and cleaned by the Illinois Environmental Protection Agency (IEPA), U.S. EPA, and various consultants for the agencies or area industries. Railroad tracks exist to the east and to the west of site. Access to the northern portion of the site is unrestricted. Access to the southern portion of site is restricted by a fence to keep vehicles out, but not pedestrians. Some random dumping of household-type waste is evident in the area.

2.1.2 Site Assessment

On April 18, 1997, START members Damon Sinars and Donovan Robin conducted a site investigation with U.S. EPA On-Scene Coordinator (OSC) Samuel Borries. U.S. EPA Remedial Project Manager (RPM) Leah Evison, U.S. EPA Ecologist James Chapman, and IEPA Project Manager Paul Takacs.

2.1.3 Sensitive Habitats

During the assessment, U.S. EPA Ecologist Chapman investigated the habitat quality found on the site. Some of the findings are summarized below. Site features are shown in Figure 2-2 and photodocumentation is presented in Appendix A.

The site acts as a wooded corridor for Dead Creek. The corridor ranges in width from approximately 20 to 100 feet, and has a predominantly cottonwood overstory. The variation in corridor width may be partially attributed to upstream flooding due to beaver dams. The trees form a mostly closed canopy over the upstream portion of the site, but Dead Creek broadens downstream so that the canopy only covers the bank. The vegetation is of low floristic quality, consisting primarily of invasive and pioneer plants. This is consistent with the fact that the wetlands were drained and the woods were cleared prior to the 1930s, and the surrounding land is highly disturbed by agriculture and industry. However, the site does provide good quality wildlife habitat, as evidenced by its use by the Black-Crowned Night Heron, a state-listed endangered species. Also, there are plentiful detrital inputs (twigs, bark, and leaf litter) to the creek, which provides a substantial food base to benthic invertebrate populations. One limitation to the benthic invertebrate population is the lack of riffle areas and therefore, a potential for periods of low dissolved oxygen levels. A list of species identified on site is presented in Appendix B.

2.1.4 Endangered Species

One federally-listed threatened species is recorded in St. Clair County, the Decurrent False Aster, *Boltonia decurrens*. The preferred habitat of the plant is alluvial prairie and marshland in river floodplains (Herkert 1991). It is unlikely to occur on the site due to the history of extensive disturbance. Since the species flowers in September and October, the present survey provided no evidence regarding its potential occurrence at the site.

Several state-listed birds are likely to utilize the site. Only the Black-Crowned Night Heron was seen on site:

Black-Crowned Night Heron, *Nycticorax nycticorax* (endangered)
Little Blue Heron, *Florida (=Egretta) caerulea* (endangered)
Snowy Egret, *Egretta thula* (endangered)
Great Egret, *Casmerodius albus* (threatened)
Pied-Billed Grebe, *Podilymbus podiceps* (threatened)

2.2 Chemicals of Concern

2.2.1 Sampling Methods

During the site investigation, nine sediment samples (F101 through F109) (including one duplicate [F109] and one background [F107] sample) were collected at various locations in the wetland (Figure 2-3). Samples were two- or three-point composites obtained using either a corer or shovel, depending on sediment consistency and water depth. The first composite point at each sampling location was collected at the deepest portion of the channel, on the east side of the surface water body. The east side of the surface water body appeared to be more permanent than the central and west sides. The sediment was scooped out and placed into a stainless steel bowl. The second composite point was collected in the central or west portion of the surface water in an area where contaminants may have been deposited. It was placed in the same bowl and the sample was thoroughly mixed and placed into a sample jar. Sampling equipment/tools were deconned following each use. The samples were sent to EIS Analytical Services in South Bend, Indiana, for metal, polychlorinated biphenyl (PCB), polyaromatic hydrocarbon (PAH), pesticide, total organic carbon (TOC), and dioxin analyses under analytical TDD S05-9704-806.

2.2.2 Chemicals at the Site

Due to resource limitations, not every parameter was analyzed for every sample. In addition, only detected contaminants are reported in the tables. Analytical results are presented in Appendix C.

Since the primary goal of this assessment was to screen for human and ecological risk, the maximum detection level for each contaminant was used. These maximums were compared with benchmark criteria, including human health risk-based values for industrial soils (U.S. EPA 1993b) and the Ontario Provincial Sediment Quality Guidelines (Persaud, et al. 1993). Table 2-1 lists the

maximum detection levels for the detected contaminants with the Sediment Quality Criteria (SQC) and a Hazard Quotient (HQ). SQC defines a Lowest Effect Level (LEL) and a Severe Effect Level (SEL) for individual contaminants, where enough information is available. LEL refers to marginally polluted sediments in which ecotoxic effects become apparent, but the majority of sediment-dwelling organisms are not affected. SEL refers to heavily polluted sediments likely to affect the health of sediment-dwelling organisms. HQ is a value equal to dose divided by guideline level. The HQ assists in identifying contaminants where severe risk potentially exists.

Results indicate that human health is not severely at risk. The maximum detections for all of the contaminants are below the human health risk-based values. When compared to ecological criteria, the data suggest contamination is a problem.

The metals data indicate that severe contamination exists from arsenic and cadmium (SEL HQs greater than 1) and minor pollution from chromium, lead, and mercury. All nine samples exceeded the SEL for arsenic (144 to 276 parts per million [ppm]), including the background which had the lowest level (144 ppm). Three samples exceeded the LEL for cadmium, one of which exceeded the SEL. The other samples, including the background, were "non detect" for cadmium. Three samples contained PCB Aroclor-1254, all of which were between the LEL and SEL. Only one sample (F105) contained PAHs. The four PAHs detected were similar to the LEL, but far below the SEL. The maximum concentration of dioxin detected exceeded the high risk concentration for both birds and mammals (Table 2-2). In addition, pesticides were not detected above background in any sample.

Sample F104 contained the highest metal concentrations; sample F102 contained the highest PCB and dioxin concentration; and sample F105 was the only sample to contain PAHs. The background sample (F107) contained the lowest concentration of each contaminant, except barium. The duplicate samples, F108 and F109, showed very similar results.

2.2.3 Assumptions and Uncertainty

This assessment is performed with the following conservative assumptions:

1) The Area Use Factor is 100%: the organism spends all of its time in the contaminated area, so is constantly exposed;

2) Bioavailability is 100%: Conditions do not limit the uptake or absorption of the contaminant;

3) The most sensitive life stage is present (e.g., early stage); and

4) Species feed entirely on the most contaminated dietary option.

Because this is a screening-level ecological risk assessment, uncertainty is intentionally assumed to be the worst-case scenario in order to not miss contamination that might be present.

2.2.4 Fate, Transport, and Ecotoxicity

A description of the sources, endpoints, and effects of the ecologically important contaminants found on site follows:

- Arsenic. Arsenic (As) is used in alloys, glass, wood preservatives, and pesticides. Pesticides were produced near the site. As an elemental metal, arsenic is highly persistent in air, water, soil, sediment, and all living tissues. Along with the possibility of being transported by runoff flowing into the stream and subsequently into the wetland, arsenic may be transported via atmospheric fallout (U.S. EPA 1978). Arsenic has been shown to strongly bioaccumulate in fish tissues and in freshwater molluscs. Arsenic appears to have relatively moderate aquatic and mammalian toxicity. A major concern with arsenic compounds is their strong mutagenic and carcinogenic potential (Ontario Ministry of the Environment [OMOE] 1992). Acute toxicity, as well as sublethal effects, have been observed in fish and invertebrates (National Oceanic and Atmospheric Administration [NOAA] 1991).

- Barium. Barium (Ba) is a naturally occurring element. High levels can decrease fecundity.

- Cadmium. Cadmium (Cd) is used principally in electroplating, batteries, pigments, plastic stabilizers, photovoltaic devices, and alloys. It is ubiquitous in the environment. Cadmium is of concern due to its high toxicity and bioavailability. High levels of cadmium are associated with high mortality, reduced growth, inhibited reproduction, and other adverse effects (NOAA 1991).

- Chromium. Chromium (Cr) is used in electroplating, steelmaking, photography, and some chemical syntheses. Chromium has been shown to bioaccumulate in fish (U.S. EPA 1978). Chromium inhibits growth in duckweed and algae, and reduces survival and fecundity in benthic macroinvertebrates. It is a carcinogen, teratogen, and mutagen (Eisler 1986).

- Lead. Potential sources of Lead (Pb) include mining, ore processing, smelting, refining, and exhaust emissions from combustion engines. Lead is used in construction material linings, X-ray and atomic radiation protection, storage batteries,

solder and lead alloys, ceramics, plastics, electronic devices, and as a gasoline additive. Lead in soil is relatively unavailable to plants, except under acidic conditions, and the majority of the absorbed lead is retained in the root system. Because of the low availability to plants and internal immobility, phytotoxicity is rarely observed (Kabata-Pendias and Pendias 1992). Lead has shown moderate ability to bioaccumulate in fish (OMOE 1992). In animals, lead can modify the function and structure of kidneys, bones, the central nervous system, and the hematopoietic system (NOAA 1991). Lead poisoning in higher organisms primarily affects hematologic and neurologic processes. Lead can also impair growth, decrease fecundity, and increase mortality rates (Eisler 1988).

- Mercury. Mercury (Hg) is primarily used in electrical apparati, paint manufacturing, industrial instruments, dental preparations, and in the production of chlorine, caustics, catalysts, fungicides, bactericides, and pharmaceuticals. The effects of mercury bioaccumulation in fish and shellfish are well documented, as evident in consumption limitations in areas with mercury contamination. Methylmercury has been shown to be the hazardous form of mercury in edible tissues of fish. Bacteria common to most natural waters have been proven capable of converting many mercury compounds to methylmercury. Therefore, virtually any mercury compound entering water may become a bioaccumulation hazard if the environmental conditions are favorable for methylation (U.S. EPA 1978). Mercury displays very high acute toxicity to fish and other aquatic organisms. Mercury is the most toxic trace metal to aquatic organisms and that toxicity is increased in the presence of zinc and lead (NOAA 1991).

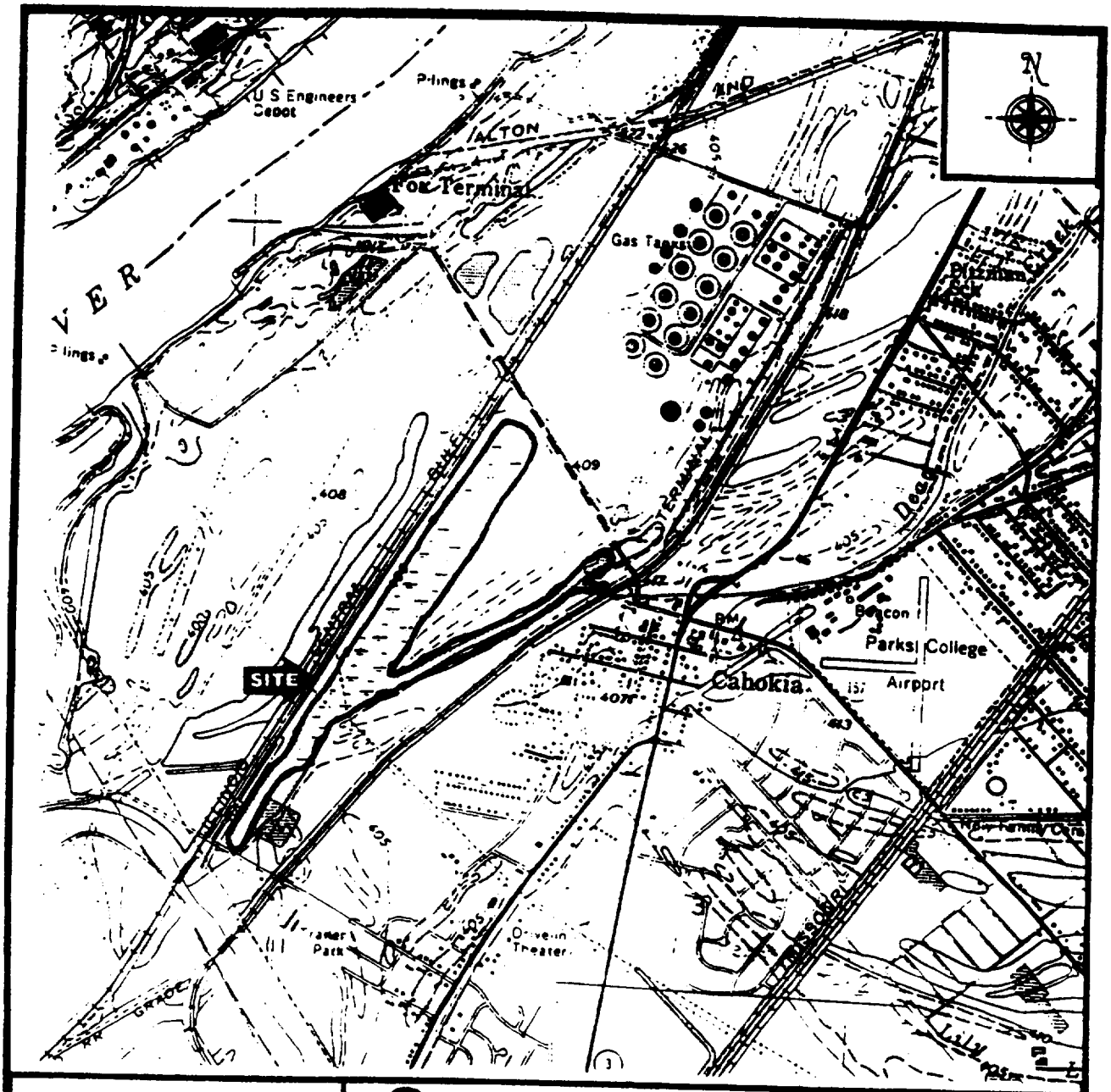
- PCBs. Polychlorinated biphenyls (PCBs) are chlorinated organic compounds that were once used for numerous purposes including as a dielectric fluid in electrical transformers. Current releases are from landfills containing PCB waste material, incineration of PCB-containing materials, and from improper disposal of materials, such as waste transformer fluids. PCBs are highly stable and cycle through the environment through evaporation, transport, deposition, and reevaporation. PCBs have been reported to bioconcentrate in fish tissues in the range of 1,076 to over 200,000 times. PCBs demonstrate very high acute and chronic toxicity to aquatic organisms, are well established as animal carcinogens, and are probable human carcinogens (OMOE 1992).

- PAHs. Polyaromatic hydrocarbons (PAHs) are semivolatile organic pollutants associated with emissions from the burning of fuels. PAHs have been reported to bioconcentrate in fish tissues. A number of PAHs demonstrate very high acute aquatic toxicity to freshwater invertebrates. Chronic aquatic toxicity is also relatively high. Some PAHs (e.g., benzo(a)pyrene) have been shown to be carcinogenic to experimental animals and are thought to be human carcinogens (OMOE 1992).

- Dioxin. Dioxin is a byproduct in the production of pesticides and herbicides, and can exist in soot, incinerator fly ash, and industrial wastes. Exceptionally low doses of this compound elicit a wide range of toxic responses in many animals, including: adverse reproductive effects, thymic atrophy, and a "wasting syndrome" leading to death (OMOE 1992). Dioxins are thought to be among the most potent animal carcinogens evaluated by U.S. EPA to date.

2.2.5 Interaction

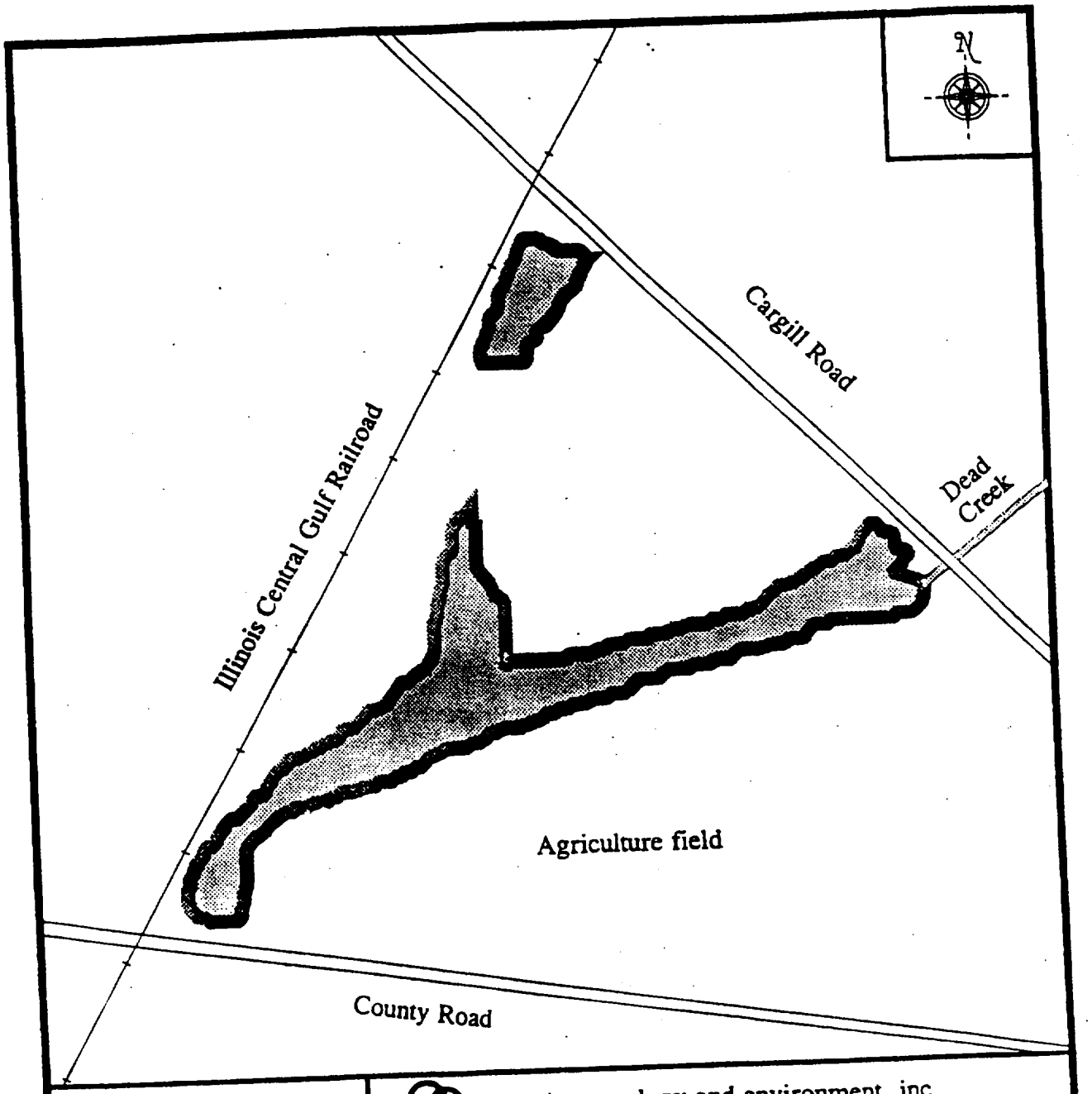
The presence of more than one contaminant may compound the harmful effects on an organism. For example, if a marginal level of lead and mercury both occur in one area, severe harmful effects on organisms may occur. Also, the presence of one contaminant may decrease the effectiveness an organism has with dealing with another contaminant.



Quadrangle Location

ecology and environment, inc.
Superfund Technical Assessment and Response Team
Region 5
33 North Dearborn Street, Chicago, Illinois 60602

TITLE: Site Location Map	FIGURE #: 2-1
SITE: Sauget Area 1	SCALE: 1:24000
CITY: Sauget STATE: Illinois	TDD: S05-9703-012
SOURCE: USGS Topographical Map, 7.5' Series Quadrangle: Cahokia, Illinois	DATE: 1980

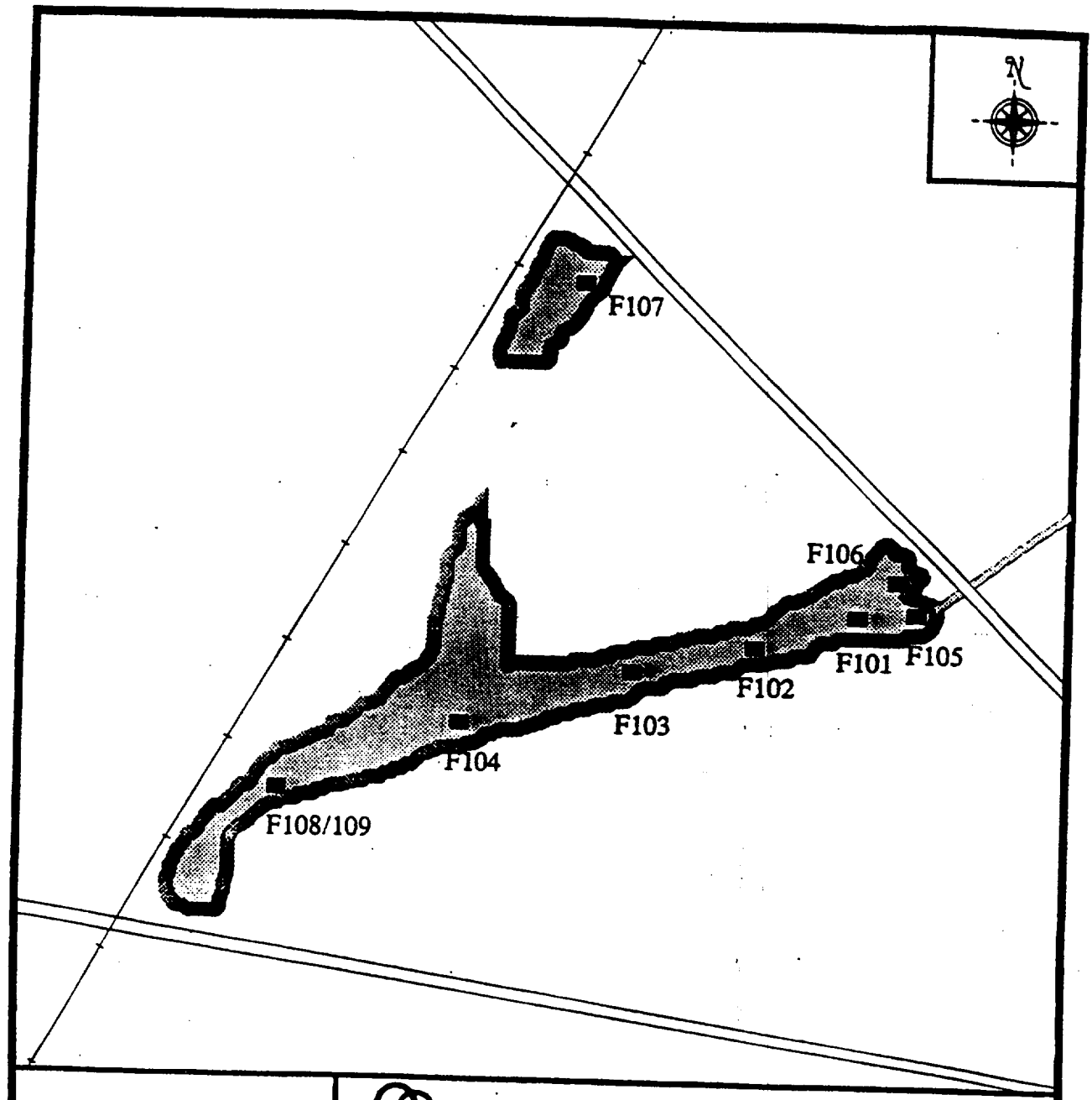


Legend

- Trees and shrubs
- Wetland
- Railroad

ecology and environment, inc.
Superfund Technical Assessment and Response Team
Region 5
33 North Dearborn Street, Chicago, Illinois 60602

TITLE: Site Features Map	FIGURE #: 2-2
SITE: Sauget Area 1	SCALE: Not to scale
CITY: Sauget STATE: Illinois	TDD: S05-9703-012
SOURCE: Ecology and Environment, Inc.	DATE: 1997



Legend

■ Sample location

ecology and environment, inc.
Superfund Technical Assessment and Response Team
Region 5
33 North Dearborn Street, Chicago, Illinois 60602

TITLE: Sample Location Map	FIGURE #: 2-3
SITE: Sauget Area 1	SCALE: Not to scale
CITY: Sauget STATE: Illinois	TDD: S05-9703-012
SOURCE: Ecology and Environment, Inc.	DATE: 1997

Table 2-1

COMPARISON OF SITE SEDIMENT DATA WITH NONREGULATORY SEDIMENT QUALITY CRITERIA
SAUGET AREA 1
SAUGET, ILLINOIS
APRIL 18, 1997

Parameter	Maximum Detection[a] (mg/kg)	Risk-Based Level[b] (mg/kg)	SQC (mg/kg)		Hazard Quotient[c] (no units)	
			LEL	SEL	LEL	SEL
Arsenic	276	310	6.0	33.0	46.0	8.4
Barium	228	72,000	NA	NA	NA	NA
Cadmium	16.3	510	0.6	10.0	27.2	1.6
Chromium	44.2	5,100	26.0	110	1.7	0.4
Lead	199	NA	31.0	250	6.4	0.8
Mercury	0.55	310	0.2	2.0	2.8	0.3
Aroclor-1254	2.1	NA	0.06	34.0	35.0	0.1
Benzo(b)fluoranthene	0.63	3.9	NA	NA	NA	NA
Benzo(g,h,i)perylene	0.52	NA	0.170	320	3.1	0.0
Fluoranthene	0.62	41,000	0.750	1020	0.8	0.0
Indeno(1,2,3-cd)pyrene	0.50	NA	0.200	320	2.5	0.0

Key:

[a] = Refers to the highest level of contaminant detected in the samples collected during the assessment.

[b] = Human health risk-based concentrations for industrial soil (U.S. EPA 1993b).

[c] = Sample concentration/SQC.

SQC = Sediment Quality Criteria: Based on the Ontario Provincial Sediment Guidelines (Persaud, et al. 1994).

LEL = Lowest Effect Level: Refers to marginally polluted sediments in which ecotoxic effects become apparent, but the majority of sediment-dwelling organisms are not affected.

SEL = Severe Effect Level: Refers to heavily polluted sediments likely to affect the health of sediment-dwelling organisms.

mg/kg = Milligrams per kilogram.

NA = Not available.

Source: EIS Analytical Services, South Bend, Indiana; Analytical TDD S05-9704-806.

Table 2-2

COMPARISON OF SITE SEDIMENT DIOXIN DATA WITH NONREGUALTORY ECOLOGICAL RISK CRITERIA[a]
SAUGET AREA 1
SAUGET, ILLINOIS
APRIL 18, 1997

Maximum Detection[b] (pg/g)	Avian Risk (pg/g)		Hazard Quotient[c] (no units)		Mammalian Risk (pg/g)		Hazard Quotient[c] (no units)	
	Low	High	Low	High	Low	High	Low	High
211	21	210	10.0	1.0	2.5	25.0	84.4	8.4

Key:

[a] = The analytical results for dioxin listed in this table were converted to dioxin 2,3,7,8-TCDD equivalent. This maximum detection is compared with sediment benchmark values obtained from U.S. EPA 1993. The values listed under "Low" represent a concentration derived from no-effects thresholds for reproductive effects in avian and mammalian wildlife. The values under "High" represent a concentration derived from doses expected to cause 50 to 100% mortality in embryos and young of sensitive avian and mammalian species.

[b] = Refers to the highest level of contaminant detected in the samples collected during the assessment.

[c] = Sample concentration/risk value.

pg/g = Picograms per gram.

Source: EIA Analytical Services, South Bend, Indiana; Analytical TDD S05-9704-806.

3. Conclusions and Recommendations

Based on this investigation, site contamination does not appear to threaten human health. Sediment contamination levels are below the risk-based values and few people enter the site boundaries.

Elevated levels of metals and PCBs may be highly detrimental to the ecology of this site. The presence of arsenic, cadmium, and dioxin greater than the SEL guideline may decrease the species richness of the area. Sensitive species, including the endangered Black-Crowned Night Heron, inhabit the site and therefore, are subject to effects such as acute toxicity, reduced growth, inhibited reproduction, and other adverse effects. Finally, species that feed on contaminated organisms may bioaccumulate the contaminants and become adversely affected.

The contamination on the site warrants further investigation and possible remediation, especially because it provides high quality wetland habitat.

4. References

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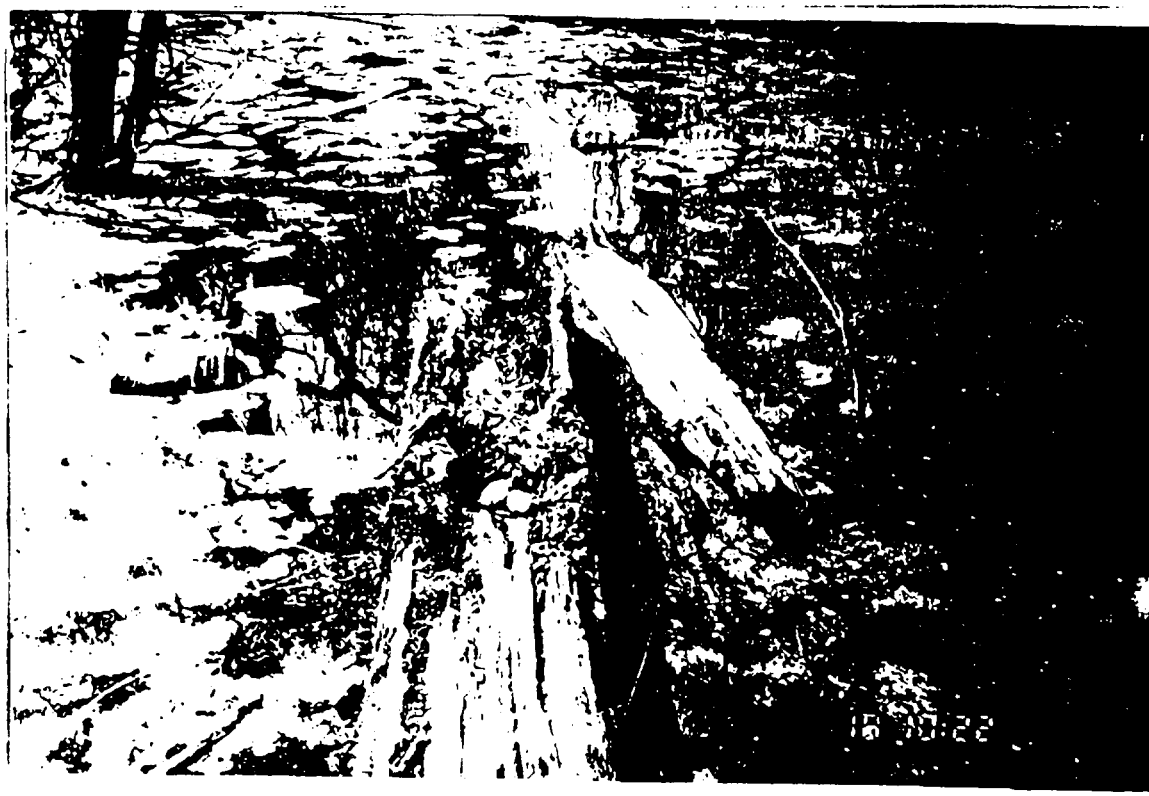
Appendix A

Photodocumentation

SITE NAME: Sauget Area 1 **TDD:** S05-9703-012 **PHOTOGRAPHER:** D. Sinars
DATE: April 18, 1997 **TIME:** 0859 **DIRECTION:** Southwest
SUBJECT: Area where Dead Creek flows into wetland.



SITE NAME: Sauget Area 1 **TDD:** S05-9703-012 **PHOTOGRAPHER:** S. Borries
DATE: April 18, 1997 **TIME:** 1022 **DIRECTION:** North
SUBJECT: Canada geese nest and bucket near sample F101.

SITE NAME: Sauget Area 1 **TDD:** S05-9703-012 **PHOTOGRAPHER:** D. Robin
DATE: April 18, 1997 **TIME:** 1031 **DIRECTION:** West
SUBJECT: START Sinars using shovel to sample F102; evidence of beavers in background.

SITE NAME: Sauget Area 1 **TDD:** S05-9703-012 **PHOTOGRAPHER:** D. Robin
DATE: April 18, 1997 **TIME:** 1215 **DIRECTION:** North
SUBJECT: START Sinars using a corer to sample F106; debris along Cargill Road in background.

Appendix B

Species List

The following species list was compiled based on observations made by James Chapman, Ph.D., Ecologist, Technical Support Section of Region 5 U.S. EPA, during the assessment of Sauget Area 1, Creek Segment F on April 18, 1997 (Chapman 1997). This is not a comprehensive biological survey. Species listed are the common, obvious species encountered near the site in early spring. Species names are based on the following texts: plants, Gleason and Cronquist 1991; birds, Peterson 1980 and Bohlen 1989; mammals, Kurta 1995; herptiles, Conant and Collins 1991; and insects, Dunn 1996 (see References, Section 4).

Aquatic Vegetation:

Lesser Duckweed, *Lemna minor*
Unidentified filamentous green algae and periphyton

Aquatic Insects:

Water Boatman (*Corixidae*)

Herptiles:

Painted Turtles, *Chrysemys picta* (approximately 100, sunning on the northeast wetland extension above the confluence with Dead Creek)

Aquatic Birds:

Black-Crowned Night Heron, *Nycticorax nycticorax*, a state-listed endangered species (three individuals at the northeast wetland extension above the confluence with Dead Creek)
Belted Kingfisher, *Megaceryle salcyon*
Canada Goose, *Branta canadensis* (nesting pair near confluence, flock on northwest backwater)
American Coot, *Fulica americana*

Riparian/Terrestrial Vegetation:

Cottonwood, *Populus deltoides* (dominant overstory species)
Boxelder, *Acer negundo*
Silver Mapel, *Acer saccharinum*
Sycamore, *Plantanus occidentalis*
Elm, *Ulmus* sp. (saplings)
Wild Black Cherry, *Prunus serotina*
Dogwood, *Cornus* sp.
Willow, *Salix* spp.
Nettle, *Urtica* sp.
Bramble, *Rubus* sp.
Poison Ivy, *Toxicodendron radicans*
Grape, Vitis sp.
Trumpet-creeper, *Campsis radicans*

Riparian/Terrestrial Vegetation, continued:

Onion, *Allium* sp.
Cleavers, *Galium aparine*
Horsetail, *Equisetum* sp.
Gill-over-the-ground, *Glechoma hederacea*
Dooryard (common blue) violet, *Viola sororia* (=*papilionacea*)
Wild White Violet, *Viola macloskeyi* (=*pallens*)
Field Penny-Cress, *Thlaspi arvense*
Short-Spurred Corydalis, *Corydalis flavula*
Sedges (*Cyperaceae*)

Birds:

Red-Winged Blackbirds, *Agelaius phoeniceus*
Robin, *Turdus migratorius*
Northern Cardinal, *Cardinalis cardinalis*
White-Throated Sparrow, *Zonotrichia albicollis*
Mourning Dove, *Zenaida macroura*
Common Flicker, *Colaptes auratus*
Blue-Gray Gnatcatcher, *Polioptila caerulea*

Mammals:

American Beaver, *Castor canadensis* (dam and vegetation marks)
White-Tailed Deer, *Odocoileus virginianus*
Common Raccoon, *Procyon lotor* (tracks)
Red Fox, *Vulped vulpes* (tracks)
Domestic Dog, *Canis familiaris* (tracks)

Appendix C

Analytical Results

- Data Summary Tables
  - C-1: Metals Data Summary
  - C-2: PCB Data Summary
  - C-3: PAH Data Summary
  - C-4: Dioxin Data Summary
- Data Validation Memoranda
- Laboratory Analytical Package

Table C-1

METALS DATA SUMMARY
SAUGET AREA 1
SAUGET, ILLINOIS
APRIL 18, 1997
(units = mg/kg)

Sample	Parameter							
	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
F101	232	145	ND	44.2	41.2	ND	ND	ND
F102	187	162	4.56	29.0	199	0.24	ND	ND
F103	213	179	8.29	43.8	111	0.30	ND	ND
F104	276	228	16.3	27.2	124	0.55	ND	ND
F105	166	116	ND	12.6	56.2	ND	ND	ND
F106	160	133	ND	12.1	28.3	ND	ND	ND
F107	144	137	ND	10.4	28.2	ND	ND	ND
F108	199	138	ND	14.9	45.7	0.12	ND	ND
F109	160	163	ND	13.9	50.2	0.11	ND	ND

Key:
ND = Non detect.
mg/kg = Milligrams per kilogram.

Source: EIS Analytical Services, South Bend, Indiana; Analytical TDD S05-9704-806.

Table C-2

PCB DATA SUMMARY
SAUGET AREA 1
SAUGET, ILLINOIS
APRIL 18, 1997
(units = mg/kg)

Sample	Parameter		
	PCB-1254	PCB-1248	PCB-1260
F101	ND	ND	ND
F102	2.1	ND	ND
F103	0.50	ND	ND
F104	0.52	ND	ND
F105	ND	ND	ND
F106	ND	ND	ND
F107	ND	ND	ND
F108	ND	ND	ND

Key:
ND = Non detect.
mg/kg = Milligrams per kilogram.

Source: EIS Analytical Services, South Bend, Indiana; Analytical TDD S05-9704-806.

Table C-3

PAH DATA SUMMARY
SAUGET AREA 1
SAUGET, ILLINOIS
APRIL 18, 1997
(units = mg/kg)

Parameter	Sample F105
Benzo(b)fluoranthene	0.63
Benzo(ghi)perylene	0.52
Fluoranthene	0.62
Indeno(1,2,3-cd)pyrene	0.50

Key:
mg/kg = Milligrams per kilogram.

Source: EIS Analytical Services, South Bend, Indiana; Analytical TDD S05-9704-806.

Table C-4

DIOXIN DATA SUMMARY[a]
SAUGET AREA 1
SAUGET, ILLINOIS
APRIL 18, 1997
(units = pg/g)

Sample	Concentration
F301	11.5
F302	211
F305	53.4
F307	2.29

Key:
[a] = Dioxin results were converted to dioxin 2,3,7,8-TCDD equivalent.
pg/g = Picograms per gram.

Source: EIS Analytical Services, South Bend, Indiana; Analytical TDD S05-9704-806.

ecology and environment, inc.
International Specialists in the Environment

33 North Dearborn Street
Chicago, Illinois 60602
Tel. 312/578-9243, Fax: 312/578-9345

M E M O R A N D U M

DATE: June 23, 1997

TO: Damon Sinars, START Project Manager, E & E, Chicago, Illinois

FROM: Lisa Graczyk, START Chemist, E & E, Chicago, Illinois

THROUGH: Dave Hendren, START Analytical Services Manager, E & E, Chicago, Illinois

SUBJECT: Data Quality Review for Polynuclear Aromatic Hydrocarbons (PAH), Sauget Area One, Sauget, St. Clair County, Illinois

REFERENCE: Project TDD S05-9703-012 Analytical TDD S05-9704-806
Project PAN 7M1201SIXX Analytical PAN 7AAF01TAXX

The data quality assurance (QA) review of five sediment samples collected from the Sauget Area One site is complete. The samples were collected on April 18, 1997, by the Superfund Technical Assessment and Response Team (START) contractor, Ecology and Environment, Inc. (E & E). The samples were submitted to EIS Analytical Services, Inc., South Bend, Indiana, for analyses. The laboratory analyses were performed according to the following United States Environmental Protection Agency (U.S. EPA) Solid Waste 846 Methods: 3540 for extraction; and 8270 for PAH analysis.

Sample Identification

START Identification No.	Laboratory Identification No.
F101	042083
F102	042084
F105	042087
F106	042088
F107	042089

Data Qualifications:

I. Sample Holding Time: Acceptable

The samples were collected on April 18, 1997. The samples were extracted on April 23, 1997 and analyzed on April 24, 1997. This is within the 14-day holding time limit, from collection to extraction, and 40-day limit from extraction to analysis.

II. Gas Chromatography/Mass Spectrometry (GC/MS) Tuning: Acceptable

GC/MS tuning to meet ion abundance criteria using decaflurotriphenylphosphine (DFTPP) was acceptable and samples were analyzed within 12 hours of DFTPP tuning.

III. Calibrations:

• Initial Calibration: Acceptable

A five-point initial calibration was performed prior to analysis. All target compounds had relative response factors of at least 0.05. The percent relative standard deviations (%RSDs) between response factors were less than 30% for all target compounds.

• Continuing Calibration: Acceptable

The percent differences of the response factors were less than 25%, as required for target compounds.

IV. Blank: Acceptable

A method blank was analyzed with the samples. No target compounds were detected in the blank.

V. Internal Standards: Acceptable

The areas of the internal standards in the samples were within -50% to +100% of the associated calibration check standards. The retention times of the internal standards were within the 30-second control limit.

VI. Compound Identification: Acceptable

The mass spectra and retention times of the detected compounds in the samples matched those of the standards.

VII. Overall Assessment of Data for Use: Acceptable

The overall usefulness of the data is based on criteria for QA Level II as outlined in the Office of Solid Waste and Emergency Response (OSWER) Directive 9360.4-01 (April 1990), Data Validation Procedures, Section 4.0, BNAs by GC/MS Analysis. Based upon the information provided, the data are acceptable for use.

ecology and environment, inc.
International Specialists in the Environment

33 North Dearborn Street
Chicago, Illinois 60602
Tel. 312/578-9243, Fax: 312/578-9345

M E M O R A N D U M

DATE: June 23, 1997

TO: Damon Sinars, START Project Manager, E & E, Chicago, Illinois

FROM: Lisa Graczyk, START Chemist, E & E, Chicago, Illinois

THROUGH: Dave Hendren, START Analytical Services Manager, E & E, Chicago, Illinois

SUBJECT: Data Quality Review for Polychlorinated Biphenyls (PCBs) and Pesticides, Sauget Area One, Sauget, St. Clair County, Illinois

REFERENCE: Project TDD S05-9703-012 Analytical TDD S05-9704-806
Project PAN 7M1201SIXX Analytical PAN 7AAF01TAXX

The data quality assurance (QA) review of nine sediment samples collected from the Sauget Area One site is complete. The samples were collected on April 18, 1997, by the Superfund Technical Assessment and Response Team (START) contractor, Ecology and Environment, Inc. (E & E). The samples were submitted to EIS Analytical Services, Inc, South Bend, Indiana, for analyses. The laboratory analyses were performed according to the United States Environmental Protection Agency (U.S. EPA) Solid Waste 846 Methods 3540B for extraction and 8081 for PCB/Pesticide analysis.

Sample Identification

START Identification No.	Laboratory Identification No.	Parameter
F101	042083	PCBs
F102	042084	PCB/Pesticides
F103	042085	PCB/Pesticides
F104	042086	PCB/Pesticides
F105	042087	PCBs
F106	042088	PCBs
F107	042089	PCB/Pesticides
F108	042090	PCBs
F109	042091	PCBs

Data Qualifications:

I. Sample Holding Time: Acceptable

The samples were collected on April 18, 1997, extracted on April 24, 1997, and analyzed on April 25 and 26, 1997. This is within the 14-day holding time limit, from collection to extraction, and 40-day limit from extraction to analysis.

II. Instrument Performance: Acceptable

The chromatographic resolution was adequate in the standard and sample chromatograms. DDT retention time was greater than 12 minutes in the standard chromatograms. Retention time windows were reported and standards were in the established windows. Surrogate retention times were consistent in the samples and standards.

III. Calibrations:

• Initial Calibration: Acceptable

A five-point initial calibration was performed prior to analysis. The percent relative standard deviations (%RSD) of calibration factors in the initial linearity check were less than 20%.

• Continuing Calibration: Acceptable

The percent differences of the response factors were less than 15% for detected compounds.

IV. Blank: Acceptable

A method blank was analyzed with the sample. No target compounds or contaminants were detected in the blank.

V. Compound Identification: Acceptable

Detected PCBs in the samples appeared to match the "fingerprint" pattern of the standard chromatograms and were confirmed on a second GC column.

VI. Additional QC Checks: Acceptable

The surrogate recoveries were within the control limits established by the laboratory.

VII. Overall Assessment of Data for Use: Acceptable

The overall usefulness of the data is based on criteria for QA Level II as outlined in the Office of Solid Waste and Emergency Response (OSWER) Directive 9360.4-01 (April 1990), Data Validation Procedures, Section 6.0, Pesticides/PCBs. Based upon the information provided, the data are acceptable for use.

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M E M O R A N D U M

DATE: June 23, 1997

TO: Damon Sinars, START Project Manager, E & E, Chicago, Illinois

FROM: Lisa Graczyk, START Chemist, E & E, Chicago, Illinois

THROUGH: Dave Hendren, START Analytical Services Manager, E & E, Chicago, Illinois

SUBJECT: Inorganic Data Quality Review for Resource Conservation and Recovery Act (RCRA) Metals, Sauget Area One, Sauget, St. Clair County, Illinois

REFERENCE: Project TDD S05-9703-012 Analytical TDD S05-9704-806
Project PAN 7M1201SIXX Analytical PAN 7AAF01TAXX

The data quality assurance (QA) review of nine sediment samples collected from the Sauget Area One site is complete. The samples were collected on April 18, 1997, by the Superfund Technical Assessment and Response Team (START) contractor, Ecology and Environment, Inc. (E & E). The samples were submitted to EIS Analytical Services, Inc., South Bend, Indiana, for analyses. The laboratory analyses were performed according to U.S. EPA solid Waste 846 Methods: 3005A for sample digestion; 6010 for arsenic, barium, cadmium, chromium, lead, selenium, and silver; and 7471 for mercury.

Sample Identification

START Identification No.	Laboratory Identification No.
F101	042083
F102	042084
F103	042085
F104	042086
F105	042087
F106	042088
F107	042089
F108	042090
F109	042091

Data Qualifications:

I. Sample Holding Time: Acceptable

The samples were collected on April 18, 1997, and analyzed between April 28 and May 1, 1997. This is within the six month holding time limit (28 days for mercury).

II. Calibration:

- Initial Calibration: Qualified

  Recoveries for the initial calibration verification were within 90 to 110% for analytes other than mercury, as required. Recoveries for mercury were not within the established limits of 80% to 120%. All positive results for mercury were flagged as "J" or estimated, as required.

- Continuing Calibration: Qualified

  All analytes included in the continuing calibration verification standard were within 90 to 110% other than mercury, as required. The recovery for mercury was 77.5% wich is outside the control limits of 80% to 120%. All positive results for mercury were flagged as "J" or estimated, as required.

III. Blanks: Acceptable

Calibration and preparation blanks were analyzed with each analytical batch. No target analytes were detected in the blanks. At least one blank was analyzed for each 20 samples.

IV. Interference Check Samples (ICSs): Acceptable

ICSs were analyzed and recoveries were acceptable.

V. Overall Assessment of Data for Use: Acceptable

The overall usefulness of the data is based on criteria for QA Level II as outlined in the Office of Solid Waste and Emergency Response (OSWER) Directive 9360.4-01 (April 1990) Data Validation Procedures, Section 3.0, Metallic Inorganic Parameters. Based upon the information provided, the data are acceptable for use.

Data Qualifiers and Definitions:

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.

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M E M O R A N D U M

DATE: June 20, 1997

TO: Damon Sinars, START Project Manager, E & E, Chicago, Illinois

FROM: Lisa Graczyk, START Chemist, E & E, Chicago, Illinois

THROUGH: Dave Hendren, START Analytical Services Manager, E & E, Chicago, Illinois

SUBJECT: Miscellaneous Data Quality Review for Total Organic Carbon (TOC), Sauget Area One, Sauget, St. Clair County, Illinois

REFERENCE: Project TDD S05-9703-012 Analytical TDD S05-9704-806
Project PAN 7M1201SIXX Analytical PAN 7AAF01TAXX

The data quality assurance (QA) review of three sediment samples collected from the Sauget Area One site is complete. The samples were collected on April 18, 1997, by the Superfund Technical Assessment and Response Team (START) contractor, Ecology and Environment, Inc. (E & E). The samples were submitted to EIS Analytical Services, Inc., South Bend, Indiana. The laboratory analyses were performed according to United States Environmental Protection Agency (U.S. EPA) Solid Waste 846 method 9060 which was modified for sediment analysis.

Sample Identification

START Identification No.	Laboratory Identification No.
F102	042084
F103	042085
F104	042086

Data Qualifications:

I. Sample Holding Time: Acceptable

The samples were collected on April 18, 1997 and analyzed on April 25, 1997. The Office of Solid Waste and Emergency Response (OSWER) Directive 9360.4-01 (April 1990) and SW846 method 9060 do not provide a holding time for TOC in sediments.

II. Calibrations: Acceptable

Method 9060 states to follow the instrument manufacturer's instructions on calibrating the instrument. No control limits are mentioned. The laboratory analyzed an initial calibration verification standard both before and after the analysis. The percent differences between true and received results were 3% and 5% respectively. This is acceptable.

III. Blanks: Acceptable

A blank was analyzed both before and after the analysis. No contaminants were found in the blank.

IV. Overall Assessment of Data for Use: Acceptable

The overall usefulness of the data is based on criteria for QA Level II as outlined in Data Validation Procedures, Section 9.0, Generic Data Validation Procedures as stated in OSWER Directive 9360.4-01 (April 1990). Based upon the information provided, the data are acceptable for use.

[redacted]

Mr David Hendren
Ecology & Environment, Inc.
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Tel No: 312-578-9243
Fax No: 312-578-9345
PO No:
Project Name: Sauget Area

Report Date:	5/22/97
EIS Order No:	970400209
EIS Sample No:	042083
EIS Project No:	2009-1000-97
Client Sample ID:	F101
Date Collected:	4/18/97
Date Received:	4/22/97
Collected By:	DMS

This report presents results of analysis for your sample(s) received under our Order No above. This Number is to be used in all inquiries concerning this report. The EIS Sample No above, as well as your Sample ID, refer to the first sample in a multi-sample submission.

DEFINITIONS:
MDL = Method Detection Limit normally achieved in the absence of interferences or other matrix difficulties.
SDL = Sample Detection Limit achieved in your sample. If numerically greater than the MDL, dilutions were required in order to perform the analysis. If numerically less than the MDL, alternate techniques were employed.

CHAIN-OF-CUSTODY is enclosed if received with your sample submission.

QUALITY ASSURANCE OFFICER

LABORATORY DIRECTOR

The data in this report has been reviewed and complies with EIS Quality Control unless specifically addressed above

SAMPLE RESULTS

CLIENT SAMPLE ID: F101
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042083
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Arsenic,Total	232	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Barium,Total	145	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Cadmium,Total	<1.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Chromium,Total	44.2	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Lead,Total	41.2	mg/kg(wet)	5	5	ClearN	4/28/97	6010
Mercury,Total	<0.1	mg/kg(wet)	0.1	0.2	ShaneD	4/30/97	7471
Selenium,Total	<5.0	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Silver,Total	<2.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010

SAMPLE RESULTS

CLIENT SAMPLE ID: F101
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042083
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Acenaphthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Acenaphthylene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(b)fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(ghi)perylene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(k)fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Chrysene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Dibenzo(a,h)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluorene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Indeno(1,2,3-cd)pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Naphthalene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	827
Phenanthrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270
Pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B

SAMPLE RESULTS

CLIENT SAMPLE ID: F101
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042083
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
PCB (AR1016)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1221)	nd	mg/kg(wet)	0.2	0.2	KlepperW	4/25/97	8081
PCB (AR1232)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1242)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1248)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1254)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1260)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F102
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042084
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Total Organic Carbon (TOC)	26600	mg/kg(wet)	5	5	BaunG	4/28/97	9060 M

SAMPLE RESULTS

CLIENT SAMPLE ID: F102
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042084
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Arsenic,Total	187	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Barium,Total	162	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Cadmium,Total	4.56	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Chromium,Total	29.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Lead,Total	199	mg/kg(wet)	5	5	ClearN	4/28/97	6010
Mercury,Total	0.24J	mg/kg(wet)	0.1	0.2	ShaneD	4/30/97	7471
Selenium,Total	<5.0	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Silver,Total	<2.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010

SAMPLE RESULTS

CLIENT SAMPLE ID: F102
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042084
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Acenaphthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Acenaphthylene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(b)fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(ghi)perylene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(k)fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Chrysene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Dibenzo(a,h)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluorene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Indeno(1,2,3-cd)pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Naphthalene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Phenanthrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B

SAMPLE RESULTS

CLIENT SAMPLE ID: F102
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042084
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
PCB (AR1016)	nd	mg/kg(wet)	0.5	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1221)	nd	mg/kg(wet)	1	0.2	CarmichaelJ	4/26/97	8081
PCB (AR1232)	nd	mg/kg(wet)	0.5	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1242)	nd	mg/kg(wet)	0.5	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1248)	nd	mg/kg(wet)	0.5	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1254)	2.1	mg/kg(wet)	0.5	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1260)	nd	mg/kg(wet)	0.5	0.1	CarmichaelJ	4/26/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F102
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042084
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Aldrin	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Chlordane(alpha)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Chlordane(gamma)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Dieldrin	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endosulfan I	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endosulfan II	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endosulfan sulfate	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endrin	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endrin aldehyde	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endrin ketone	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Heptachlor	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (alpha-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (beta-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (delta-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (gamma-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Methoxychlor	nd	mg/kg(wet)	0.25	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDD	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDE	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDT	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Toxaphene	nd	mg/kg(wet)	2.5	0.2	CarmichaelJ	4/26/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F103
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042085
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Total Organic Carbon (TOC)	16900	mg/kg(wet)	5	5	BaunG	4/28/97	9060 M

SAMPLE RESULTS

CLIENT SAMPLE ID: F103
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042085
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Arsenic,Total	213	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Barium,Total	179	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Cadmium,Total	8.29	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Chromium,Total	43.8	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Lead,Total	111	mg/kg(wet)	5	5	ClearN	4/28/97	6010
Mercury,Total	0.30 J	mg/kg(wet)	0.1	0.2	ShaneD	4/30/97	7471
Selenium,Total	<5.0	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Silver,Total	<2.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010

SAMPLE RESULTS

CLIENT SAMPLE ID: F103
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042085
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
PCB (AR1016)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1221)	nd	mg/kg(wet)	0.2	0.2	CarmichaelJ	4/26/97	8081
PCB (AR1232)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1242)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1248)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1254)	0.50	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1260)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F103
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042065
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Aldrin	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Chlordane(alpha)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Chlordane(gamma)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Dieldrin	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endosulfan I	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endosulfan II	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endosulfan sulfate	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endrin	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endrin aldehyde	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endrin ketone	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Heptachlor	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (alpha-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (beta-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (delta-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (gamma-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Methoxychlor	nd	mg/kg(wet)	0.25	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDD	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDE	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDT	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Toxaphene	nd	mg/kg(wet)	2.5	0.2	CarmichaelJ	4/26/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F104
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042086
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Total Organic Carbon (TOC)	17600	mg/kg(wet)	5	5	BaunG	4/28/97	9060 M

SAMPLE RESULTS

CLIENT SAMPLE ID: F104
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042086
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Arsenic,Total	276	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Barium,Total	228	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Cadmium,Total	16.3	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Chromium,Total	27.2	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Lead,Total	124	mg/kg(wet)	5	5	ClearN	4/28/97	6010
Mercury,Total	0.55J	mg/kg(wet)	0.11	0.2	ShaneD	4/30/97	7471
Selenium,Total	<5.0	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Silver,Total	<2.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010

SAMPLE RESULTS

CLIENT SAMPLE ID: F104
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042086
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
PCB (AR1016)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1221)	nd	mg/kg(wet)	0.2	0.2	CarmichaelJ	4/26/97	8081
PCB (AR1232)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1242)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1248)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1254)	0.52	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1260)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F104
Date Collected: 4/16/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042086
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Aldrin	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Chlordane(alpha)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Chlordane(gamma)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Dieldrin	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endosulfan I	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endosulfan II	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endosulfan sulfate	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endrin	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endrin aldehyde	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Endrin ketone	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Heptachlor	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (alpha-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (beta-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	808
Hexachlorocyclohexane (delta-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (gamma-BHC)	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Methoxychlor	nd	mg/kg(wet)	0.25	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDD	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDE	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDT	nd	mg/kg(wet)	0.05	0.005	CarmichaelJ	4/26/97	8081
Toxaphene	nd	mg/kg(wet)	2.5	0.2	CarmichaelJ	4/26/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F105
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042087
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Arsenic,Total	166	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Barium,Total	116	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Cadmium,Total	<1.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Chromium,Total	12.6	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Lead,Total	56.2	mg/kg(wet)	5	5	ClearN	4/28/97	6010
Mercury,Total	<0.12	mg/kg(wet)	0.12	0.2	ShaneD	4/30/97	7471
Selenium,Total	<5.0	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Silver,Total	<2.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010

SAMPLE RESULTS

CLIENT SAMPLE ID: F105
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042087
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Acenaphthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Acenaphthylene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(b)fluoranthene	0.63	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(ghi)perylene	0.52	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(k)fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Chrysene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Dibenzo(a,h)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluoranthene	0.62	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluorene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Indeno(1,2,3-cd)pyrene	0.50	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Naphthalene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Phenanthrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B

SAMPLE RESULTS

CLIENT SAMPLE ID: F105
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042087
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
PCB (AR1016)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1221)	nd	mg/kg(wet)	0.2	0.2	KlepperW	4/25/97	8081
PCB (AR1232)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1242)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1248)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1254)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1260)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F106
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042088
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Arsenic,Total	160	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Barium,Total	133	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Cadmium,Total	<1.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Chromium,Total	12.1	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Lead,Total	28.3	mg/kg(wet)	5	5	ClearN	4/28/97	6010
Mercury,Total	<0.13	mg/kg(wet)	0.13	0.2	ShaneD	4/30/97	7471
Selenium,Total	<5.0	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Silver,Total	<2.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010

SAMPLE RESULTS

CLIENT SAMPLE ID: F106
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042068
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Acenaphthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Acenaphthylene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(b)fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(ghi)perylene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(k)fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Chrysene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Dibenzo(a,h)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluorene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Indeno(1,2,3-cd)pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Naphthalene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Phenanthrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B

SAMPLE RESULTS

CLIENT SAMPLE ID: F106
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042088
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
PCB (AR1016)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1221)	nd	mg/kg(wet)	0.2	0.2	KlepperW	4/25/97	8081
PCB (AR1232)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1242)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1248)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1254)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1260)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F107
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042089
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Arsenic,Total	144	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Barium,Total	137	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Cadmium,Total	<1.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Chromium,Total	10.4	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Lead,Total	28.2	mg/kg(wet)	5	5	ClearN	4/28/97	6010
Mercury,Total	<0.13	mg/kg(wet)	0.13	0.2	ShaneD	4/30/97	7471
Selenium,Total	<5.0	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Silver,Total	<2.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010

SAMPLE RESULTS

CLIENT SAMPLE ID: F107
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042089
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Acenaphthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Acenaphthylene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(a)pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(b)fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(ghi)perylene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Benzo(k)fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Chrysene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Dibenzo(a,h)anthracene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluoranthene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Fluorene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B
Indeno(1,2,3-cd)pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270
Naphthalene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270
Phenanthrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270
Pyrene	nd	mg/kg(wet)	0.5	0.5	DavisW	4/24/97	8270 B

SAMPLE RESULTS

CLIENT SAMPLE ID: F107
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042089
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
PCB (AR1016)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1221)	nd	mg/kg(wet)	0.2	0.2	CarmichaelJ	4/26/97	8081
PCB (AR1232)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1242)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1248)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1254)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081
PCB (AR1260)	nd	mg/kg(wet)	0.1	0.1	CarmichaelJ	4/26/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F107
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042069
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Aldrin	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Chlordane(alpha)	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Chlordane(gamma)	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Dieldrin	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Endosulfan I	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Endosulfan II	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Endosulfan sulfate	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Endrin	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Endrin aldehyde	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Endrin ketone	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Heptachlor	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (alpha-BHC)	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (beta-BHC)	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Hexachlorocyclohexane (delta-BHC)	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	808
Hexachlorocyclohexane (gamma-BHC)	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	808
Methoxychlor	nd	mg/kg(wet)	0.02	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDD	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDE	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
P,P'-DDT	nd	mg/kg(wet)	0.005	0.005	CarmichaelJ	4/26/97	8081
Toxaphene	nd	mg/kg(wet)	0.2	0.2	CarmichaelJ	4/26/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F108
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042090
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Arsenic,Total	199	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Barium,Total	138	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Cadmium,Total	<1.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Chromium,Total	14.9	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Lead,Total	45.7	mg/kg(wet)	5	5	ClearN	4/28/97	6010
Mercury,Total	0.12J	mg/kg(wet)	0.11	0.2	ShaneD	4/30/97	7471
Selenium,Total	<5.0	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Silver,Total	<2.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010

SAMPLE RESULTS

CLIENT SAMPLE ID: F108
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042090
EIS Order No: 970:00209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
PCB (AR1016)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1221)	nd	mg/kg(wet)	0.2	0.2	KlepperW	4/25/97	8081
PCB (AR1232)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1242)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1248)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1254)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1260)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081

SAMPLE RESULTS

CLIENT SAMPLE ID: F109
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042091
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
Arsenic,Total	160	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Barium,Total	163	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Cadmium,Total	<1.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Chromium,Total	13.9	mg/kg(wet)	1	1	ClearN	4/28/97	6010
Lead,Total	50.2	mg/kg(wet)	5	5	ClearN	4/28/97	6010
Mercury,Total	0.11J	mg/kg(wet)	0.11	0.2	ShaneD	4/30/97	7471
Selenium,Total	<5.0	mg/kg(wet)	5	5	ClearN	5/1/97	6010
Silver,Total	<2.0	mg/kg(wet)	1	1	ClearN	4/28/97	6010

SAMPLE RESULTS

CLIENT SAMPLE ID: F109
Date Collected: 4/18/97
Date Received: 4/22/97

Report Date: 5/22/97
EIS Sample No: 042091
EIS Order No: 970400209

Parameter	Results	Units	SDL	MDL	Analyst	Test Date	Method
PCB (AR1016)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1221)	nd	mg/kg(wet)	0.2	0.2	KlepperW	4/25/97	8081
PCB (AR1232)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1242)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1248)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1254)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081
PCB (AR1260)	nd	mg/kg(wet)	0.1	0.1	KlepperW	4/25/97	8081

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M E M O R A N D U M

DATE: June 23, 1997

TO: Damon Sinars, START Project Manager, E & E, Chicago, Illinois

FROM: David Hendren, START Analytical Services Manager, E & E, Chicago, Illinois

THROUGH: Mary Jane Ripp, Assistant START Program Manager, E & E, Chicago, Illinois

SUBJECT: Data Quality Review for Polychlorinated Dibenzodioxin/Polychlorinated Dibenzofuran (PCDD/PCDF), Sauget Area One, Sauget, St. Clair County, Illinois

REFERENCE: Project TDD S05-9703-012 Analytical TDD S05-9704-806
Project PAN 7M1201SIXX Analytical PAN 7AAF01TAXX

The data quality assurance (QA) review of four sediment samples collected from the Sauget Area One site is complete. The samples were collected on April 18, 1997, by the Superfund Technical Assessment and Response Team (START) contractor, Ecology and Environment, Inc. (E & E). The samples were submitted to EIS Analytical Services, Inc., South Bend, Indiana. The laboratory analyses were performed according to the United States Environmental Protection Agency (U.S. EPA) Solid Waste 846 Method 8290.

Sample Identification

START Identification No.	Laboratory Identification No.
F301	42092
F302	42093
F305	42094
F307	42095

Data Qualifications:

I. Sample Holding Time: Acceptable

The samples were collected on April 18, 1997, extracted on April 27, 1997, and analyzed on May 5, 1997. This is within the six-month holding time limit, from collection to extraction and 40-day limit from extraction to analysis.

II. Gas Chromatography/Mass Spectrometry (GC/MS) Performance: Acceptable

Acceptable chromatographic resolution was demonstrated through the separation of 2,3,7,8-tetrachlorodibenzodioxin (TCDD) and 2,3,7,8-tetrachlorodibenzofuran (TCDF) isomers. The resolution of the mass spectrometer was verified before analysis.

III. Calibrations:

• Initial Calibration: Acceptable

A five-point initial calibration was performed prior to analysis. The percent relative standard deviations (%RSDs) between response factors were less than 20% for TCDD/TCDF.

• Continuing Calibration: Acceptable

The percent differences of the response factors were less than 15%, as required, for TCDD/TCDF.

IV. Blank: Acceptable

A method blank was analyzed with the samples. No target compounds or contaminants were detected in the blank.

V. Compound Identification: Acceptable

Identification of PCDD/PCDF present in the samples was based on numerous criteria, as specified in the method.

VI. Additional QC Checks: Acceptable

The recoveries of the internal standards added to each sample were within acceptable limits.

VII. Overall Assessment of Data for Use: Acceptable

The overall usefulness of the data is based on criteria for QA Level II as outlined in the Office of Solid Waste and Emergency Response (OSWER) Directive 9360.4-01 (April 1990), Data Validation Procedures, Section 8.0, 2,3,7,8-TCDD. Based upon the information provided, the data are acceptable for use.

TLI Project: **41521** Method 8290 PCDD/PCDF Analysis

Client Sample: **F301** Analysis File: **S973012**

Client Project:	Dioxins/Furans				
Sample Matrix:	SEDIMENT	Date Received:	04/23/97	Spike File:	SPX2372S
TLI ID:	165-74-1	Date Extracted:	04/27/97	ICal:	SF52067
		Date Analyzed:	05/05/97	ConCal:	S973006
Sample Size:	16.240 g	Dilution Factor:	n/a	% Moisture:	38.4
Dry Weight:	10.004 g	Blank File:	S972991	% Lipid:	n/a
GC Column:	DB-5	Analyst:	ADP	% Solids:	61.6

Analyte	Conc (ppt)	DL	EMPC	RT		Flags
2,3,7,8-TCDD	ND	0.7				
1,2,3,7,8-PeCDD	EMPC		1.4			
1,2,3,4,7,8-HxCDD	4.1			1.07	27:38	
1,2,3,6,7,8-HxCDD	8.3			1.25	27:44	
1,2,3,7,8,9-HxCDD	7.9			1.11	28:01	
1,2,3,4,6,7,8-HpCDD	213			1.14	30:38	
1,2,3,4,6,7,8,9-OCDD	3250			0.80	33:02	
2,3,7,8-TCDF	3.5			0.69	17:56	
1,2,3,7,8-PeCDF	0.66			1.51	22:54	
2,3,4,7,8-PeCDF	1.1			1.40	23:46	
1,2,3,4,7,8-HxCDF	EMPC		9.2			E
1,2,3,6,7,8-HxCDF	1.8			1.26	26:57	
2,3,4,6,7,8-HxCDF	1.8			1.07	27:29	PR
1,2,3,7,8,9-HxCDF	ND	1.2				
1,2,3,4,6,7,8-HpCDF	210			0.90	29:45	
1,2,3,4,7,8,9-HpCDF	12.5			0.91	30:58	
1,2,3,4,6,7,8,9-OCDF	603			0.82	33:07	

Totals	Conc (ppt)	Number of Peaks	EMPC	Flags
Total TCDD	58.5	8	62.8	
Total PeCDD	45.9	5	72.1	
Total HxCDD	92.6	6	113	
Total HpCDD	446	2		
Total TCDF	33.0	11	37.7	E
Total PeCDF	24.3	6	39.2	E
Total HxCDF	82.7	6	96.3	E
Total HpCDF	558	3		

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TLI Project: **41521** Method 8290 PCDD/PCDF Analysis (b)
Client Sample: **F301** Analysis File: **S973012**

Internal Standards	Conc. (ppt)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-2,3,7,8-TCDF	55	77..	40%-130%	0.76	17:55	—
$^{13}C_{12}$-2,3,7,8-TCDD	50	74.8	40%-130%	0.73	18:53	—
$^{13}C_{12}$-1,2,3,7,8-PeCDF	63	81.4	40%-130%	1.46	22:54	—
$^{13}C_{12}$-1,2,3,7,8-PeCDD	80	89.5	40%-130%	1.57	24:10	—
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	57	68.3	40%-130%	0.48	26:57	—
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	63	81.4	40%-130%	1.21	27:43	—
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	177	88.3	25%-130%	0.39	29:45	—
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	186	93.1	25%-130%	1.01	30:38	—
$^{13}C_{12}$-1,2,3,4,6,7,8,9-OCDD	378	94.6	25%-130%	0.87	33:02	—

Surrogate Standards (Type B)	Conc. (ppt)	% Recov	QC Limits	Ratio	RT	Flags
$^{37}Cl_4$-2,3,7,8-TCDD	14.6	73.0	40%-130%		18:54	—
$^{13}C_{12}$-2,3,4,7,8-PeCDF	157	78.4	40%-130%	1.48	23:45	—
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	151	75.3	40%-130%	0.48	26:49	—
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	173	86.7	40%-130%	1.20	27:38	—
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	177	88.6	25%-130%	0.39	30:58	—

Alternate Standards (Type B)	Conc. (ppt)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	171	85.7	40%-130%	0.48	28:12	—
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	148	74.2	40%-130%	0.48	27:28	—

Recovery Standards	Conc. (ppt)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-1,2,3,4-TCDD				0.75	18:38	—
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD				1.24	28:00	—

Data Reviewer: 3-A 05/09/97

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TLI Project: 41521r1 Method 8[illegible]0 PCDD/PCDF Analysis

Client Sample: F302 Analysis File: T973246

Client Project:	Dioxin /Furans				
Sample Matrix:	SEDIMENT	Date Received:	04/23/97	Spike File:	SPX2372S
TLI ID:	165-74-	Date Extracted:	05/06/97	ICal:	TF53286
		Date Analyzed:	05/10/97	ConCal:	T973236
Sample Size:	20.300	Dilution Factor:	n/a	% Moisture:	50.5
Dry Weight:	10.049 g	Blank File:	T973240	% Lipid:	n/a
GC Column:	DB-5	Analyst:	BB	% Solids:	49.5

Analyte	Conc (pg/g)	EMPC	Ratio	RT	Flags
2,3,7,8-TCDD	26.1		0.80	21:39	—
1,2,3,7,8-PeCDD	32.9		1.51	26:09	—
1,2,3,4,7,8-HxCDD	59.7		1.24	29:22	—
1,2,3,6,7,8-HxCDD	497		1.23	29:26	—
1,2,3,7,8,9-HxCDD	157		1.19	29:44	—
2,3,7,8-TCDF	176		0.81	20:53	—
1,2,3,7,8-PeCDF	27.9		1.68	25:03	PR
2,3,4,7,8-PeCDF	63.0		1.54	25:48	—
1,2,3,4,7,8-HxCDF	EMPC	504			E
1,2,3,6,7,8-HxCDF	86.3		1.28	28:44	—
2,3,4,6,7,8-HxCDF	178		1.23	29:12	—
1,2,3,7,8,9-HxCDF	7.1		1.24	29:57	—

Totals	Conc (pg/g)	Number	EMPC	Flags
Total TCDD	1820	8	1900	—
Total PeCDD	305	7	1500	—
Total HxCDD	3140	8	4380	—
Total TCDF	1630	16	1640	—
Total PeCDF	2210	14	2440	—
Total HxCDF	6320	8	6870	—

Internal Standards	Conc (pg/g)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-2,3,7,8-TCDF	149	75.0	40%-130%	0.75	20:50	—
$^{13}C_{12}$-2,3,7,8-TCDD	141	70.9	40%-130%	0.82	21:37	—
$^{13}C_{12}$-1,2,3,7,8-PeCDF	129	64.6	40%-130%	1.42	25:02	—
$^{13}C_{12}$-1,2,3,7,8-PeCDD	132	66.4	40%-130%	1.48	26:09	—
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	165	82.9	40%-130%	0.51	28:43	—
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	178	89.6	40%-130%	1.20	29:26	—

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TLI Project: **41521r1** Method 8290 PCDD/PCDF Analysis (b)

Client Sample: **F302** Analysis File: **T973246**

Surrogate Standards (Type B)	Conc. (ppt)	% Recovery	QC Limits	Ratio	RT	Flags
$^{37}Cl_4$-2,3,7,8-TCDD	16.5	83.0	40%-130%		21:39	—
$^{13}C_{12}$-2,3,4,7,8-PeCDF	141	71.0	40%-130%	1.51	25:47	—
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	181	90.8	40%-130%	0.48	28:37	—
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	178	89.3	40%-130%	1.21	29:21	—

Alternate Standards (Type B)	Conc. (ppt)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	177	89.0	40%-130%	0.51	29:56	—
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	169	84.8	40%-130%	0.50	29:13	—

Recovery Standards	Ratio	RT	Flags
$^{13}C_{12}$-1,2,3,4-TCDD	0.81	21:26	—
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	1.24	29:43	—

Data Reviewer: _____ 05/13/97

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TLI Project: **41521r1** Method 8290 PCDD/PCDF Analysis

Client Sample: **F305** Analysis File: **T973247**

Client Project:	Dioxins/Furans				
Sample Matrix:	SEDIMENT	Date Received:	04/23/97	Spike File:	SPX2372S
TLI ID:	165-74-3	Date Extracted:	05/06/97	ICal:	TF53286
		Date Analyzed:	05/10/97	ConCal:	T973236
Sample Size:	15.830 g	Dilution Factor:	n/a	% Moisture:	36.9
Dry Weight:	9.989 g	Blank File:	T973240	% Lipid:	n/a
GC Column:	DB-5	Analyst:	BB	% Solids:	63.1

Analyte	Conc (ppt)	EMPC	Ratio	RT	Flags
2,3,7,8-TCDD	2.5		0.71	21:40	
1,2,3,7,8-PeCDD	EMPC	4.3			
1,2,3,4,7,8-HxCDD	9.3		1.23	29:23	
1,2,3,6,7,8-HxCDD	43.7		1.26	29:28	
1,2,3,7,8,9-HxCDD	19.3		1.22	29:45	
1,2,3,4,6,7,8-HpCDD	1350		1.05	32:16	
1,2,3,4,6,7,8,9-OCDD	11590		0.83	34:44	
2,3,7,8-TCDF	12.4		0.84	20:53	
1,2,3,7,8-PeCDF	3.0		1.52	25:04	PR
2,3,4,7,8-PeCDF	5.5		1.53	25:49	
1,2,3,4,7,8-HxCDF	EMPC	41.0			E
1,2,3,6,7,8-HxCDF	11.8		1.24	28:45	
2,3,4,6,7,8-HxCDF	14.0		1.30	29:15	PR
1,2,3,7,8,9-HxCDF	0.96		1.05	29:58	PR
1,2,3,4,6,7,8-HpCDF	609		1.05	31:25	
1,2,3,4,7,8,9-HpCDF	45.3		1.09	32:36	
1,2,3,4,6,7,8,9-OCDF	5190		0.90	34:51	

Totals	Conc (ppt)	Number Det.	EMPC	Flags
Total TCDD	73.5	9	84.4	
Total PeCDD	45.8	5	160	
Total HxCDD	289	7	436	
Total HpCDD	2490	2		
Total TCDF	129	15	132	
Total PeCDF	219	10	266	E
Total HxCDF	582	8	631	
Total HpCDF	2720	3		

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TLI Project: **41521r1** Method 8290 PCDD/PCDF Analysis (b)
Client Sample: **F305** Analysis File: **T973247**

Internal Standards	Conc. (ppt)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-2,3,7,8-TCDF	117	58.2	40%-130%	0.76	20:52	—
$^{13}C_{12}$-2,3,7,8-TCDD	101	50.6	40%-130%	0.83	21:39	—
$^{13}C_{12}$-1,2,3,7,8-PeCDF	95.8	47.9	40%-130%	1.50	25:04	—
$^{13}C_{12}$-1,2,3,7,8-PeCDD	99.4	49.7	40%-130%	1.48	26:10	—
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	128	63.9	40%-130%	0.52	28:44	—
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	140	69.9	40%-130%	1.21	29:27	—
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	132	66.0	25%-130%	0.44	31:24	—
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	125	62.3	25%-130%	1.00	32:15	—
$^{13}C_{12}$-1,2,3,4,6,7,8,9-OCDD	233	58.1	25%-130%	0.87	34:44	—

Surrogate Standards (Type B)	Conc. (ppt)	% Recovery	QC Limits	Ratio	RT	Flags
$^{37}Cl_4$-2,3,7,8-TCDD	10.4	52.2	40%-130%		21:40	—
$^{13}C_{12}$-2,3,4,7,8-PeCDF	99.4	49.7	40%-130%	1.49	25:49	—
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	130	65.0	40%-130%	0.50	28:39	—
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	138	68.9	40%-130%	1.22	29:22	—
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	140	69.7	25%-130%	0.43	32:36	—

Alternate Standards (Type B)	Conc. (ppt)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	144	72.1	40%-130%	0.52	29:57	—
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	130	65.1	40%-130%	0.51	29:15	—

Recovery Standards	%	Ratio	RT	Flags
$^{13}C_{12}$-1,2,3,4-TCDD		0.81	21:27	—
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD		1.24	29:45	—

Data Reviewer: _____ 05/13/97

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TLI Project: 41521 Method 8290 PCDD/PCDF Analysis (b)
Client Sample: F307 Analysis File: S973015

Client Project:	Dioxins/Furans				
Sample Matrix:	SEDIMENT	Date Received:	04/23/97	Spike File:	SPX2372S
TLI ID:	165-74-4	Date Extracted:	04/27/97	ICal:	SF52067
		Date Analyzed:	05/05/97	ConCal:	S973006
Sample Size:	14.430 g	Dilution Factor:	n/a	% Moisture:	30.8
Dry Weight:	9.986 g	Blank File:	S972991	% Lipid:	n/a
GC Column:	DB-5	Analyst:	ADP	% Solids:	69.2

Analyte	Conc (ppt)	DL	EMPC	Ratio	RT	Flags
2,3,7,8-TCDD	ND	0.6				
1,2,3,7,8-PeCDD	ND	0.8				
1,2,3,4,7,8-HxCDD	ND	1.4				
1,2,3,6,7,8-HxCDD	EMPC		3.3			
1,2,3,7,8,9-HxCDD	3.0			1.26	28:02	
1,2,3,4,6,7,8-HpCDD	53.0			0.99	30:38	
1,2,3,4,6,7,8,9-OCDD	599			0.81	33:03	
2,3,7,8-TCDF	3.4			0.80	17:56	
1,2,3,7,8-PeCDF	ND	0.6				
2,3,4,7,8-PeCDF	EMPC		1.2			
1,2,3,4,7,8-HxCDF	EMPC		4.5			E
1,2,3,6,7,8-HxCDF	1.2			1.20	26:58	
2,3,4,6,7,8-HxCDF	1.4			1.09	27:29	
1,2,3,7,8,9-HxCDF	ND	1.0				
1,2,3,4,6,7,8-HpCDF	21.2			0.96	29:46	
1,2,3,4,7,8,9-HpCDF	ND	1.3				
1,2,3,4,6,7,8,9-OCDF	49.8			0.84	33:07	

Totals	Conc (ppt)	Number	EMPC	Flags
Total TCDD	17.1	5	25.0	
Total PeCDD	21.8	5	28.9	
Total HxCDD	19.2	3	36.9	
Total HpCDD	105	2		
Total TCDF	18.7	9	25.4	E
Total PeCDF	8.8	2	31.8	E
Total HxCDF	18.4	4	25.6	E
Total HpCDF	55.7	2		

LI Project: **41521**
Client Sample: **F307**

Method 8290 PCDD/PCDF Analysis (b)
Analysis File: **S973015**

Internal Standards	Conc (pg/L)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-2,3,7,8-TCDF	84.9	42.4	40%-130%	0.75	17:56	
$^{13}C_{12}$-2,3,7,8-TCDD	77.5	38.7	40%-130%	0.83	18:54	V
$^{13}C_{12}$-1,2,3,7,8-PeCDF	79.2	39.5	40%-130%	1.45	22:54	V
$^{13}C_{12}$-1,2,3,7,8-PeCDD	98.4	49.2	40%-130%	1.46	24:11	
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	78.3	39.1	40%-130%	0.48	26:57	V
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	85.9	42.9	40%-130%	1.22	27:43	
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	80.3	40.1	25%-130%	0.42	29:45	
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	102	51.1	25%-130%	0.97	30:38	
$^{13}C_{12}$-1,2,3,4,6,7,8,9-OCDD	214	53.5	25%-130%	0.82	33:02	

Surrogate (Standard)	Conc (pg/L)	% Recovery	QC Limits	Ratio	RT	Flags
$^{37}Cl_4$-2,3,7,8-TCDD	6.9	34.6	40%-130%		18:55	V
$^{13}C_{12}$-2,3,4,7,8-PeCDF	84.8	42.4	40%-130%	1.43	23:45	
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	85.8	42.8	40%-130%	0.49	26:50	
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	85.8	42.9	40%-130%	1.20	27:38	
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	89.2	44.5	25%-130%	0.39	30:58	

Alternate Standard	Conc (pg/L)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	89.4	44.6	40%-130%	0.48	28:12	
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	83.7	41.8	40%-130%	0.49	27:29	

Recovery Standards	Conc (pg/L)	% Recovery	QC Limits	Ratio	RT	Flags
$^{13}C_{12}$-1,2,3,4-TCDD				0.84	18:38	
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD				1.21	28:01	

Data Reviewer: S.A. 05/09/97

Triangle Laboratories, Inc.®
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Appendix B

Existing Domestic Well Water Quality Data

SAUGET Analytical Data
Site Area 1 Private Wells

GROUND WATER SAMPLES
Volatile Organic Compounds (µg/L)
Collected by Ecology & Environment, Inc. (3/87)

	Sample Number	DC-GW-52	DC-GW-53	DC-GW-54	DC-GW-55	Maximum
	Well Number	WRIGHT	SETTLES	SCHMIDT	McDONALD	Concentration
VOC	Date Collected	03/26/87	03/26/87	03/26/87	03/26/87	Detected
Chloromethane		ND	ND	ND	ND	ND
Bromomethane		ND	ND	ND	ND	ND
Vinyl chloride		ND	ND	ND	ND	ND
Chloroethane		ND	ND	ND	ND	ND
Methylene chloride		4 BJ	12 B	ND	37 B	37 B
Acetone		18 B	10 B	8 BJ	9 BJ	18 B
Carbon Disulfide		ND	3 J	ND	ND	3 J
1,1-Dichloroethene		ND	ND	ND	ND	ND
1,1-Dichloroethane		ND	ND	ND	ND	ND
trans-1,2-Dichloroethene		ND	ND	ND	ND	ND
Chloroform		ND	2 J	ND	ND	2 J
1,2-Dichloroethane		ND	ND	ND	ND	ND
2-Butanone (MEK)		ND	ND	ND	ND	ND
1,1,1-Trichloroethane		ND	ND	ND	ND	ND
Carbon Tetrachloride		ND	ND	ND	ND	ND
Vinyl Acetate		ND	ND	ND	ND	ND
Bromodichloromethane		ND	ND	ND	ND	ND
1,2-Dichloropropane		ND	ND	ND	ND	ND
trans-1,3-Dichloropropene		ND	ND	ND	ND	ND
Trichloroethene		ND	ND	ND	ND	ND
Dibromochloromethane		ND	ND	ND	ND	ND
1,1,2-Trichloroethane		ND	ND	ND	ND	ND
Benzene		ND	ND	ND	ND	ND
cis-1,3-Dichloropropene		ND	ND	ND	ND	ND
2-Chloroethyl Vinyl Ether		ND	ND	ND	ND	ND
Bromoform		ND	ND	ND	ND	ND
4-Methyl-2-pentanone		ND	ND	ND	ND	ND
2-Hexanone		ND	ND	ND	ND	ND
Tetrachloroethene		ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane		ND	ND	ND	ND	ND
Toluene		1 BJ	1 BJ	ND	1 BJ	1 BJ
Chlorobenzene		ND	ND	ND	ND	ND
Ethylbenzene		4 J	ND	ND	ND	4 J
Styrene		ND	2 J	ND	2 J	2 J
Total Xylenes		ND	ND	ND	ND	ND

µg/L - Micrograms per liter
B - Compound also detected in blank
J - Estimated value
ND - Not detected

SAUGET Analytical Data
Site Area 1 Private Wells

GROUND WATER SAMPLES
Base Neutrals/Acids (µg/L)
Collected by Ecology & Environment, Inc. (3/87)

	Sample Number	DC-GW-52	DC-GW-53	DC-GW-54	DC-GW-55	Maximum
	Well Number	WRIGHT	SETTLES	SCHMIDT	McDONALD	Concentration
	Date Collected	03/26/87	03/26/87	03/26/87	03/26/87	Detected
BNAs						
Phenol		ND	ND	ND	ND	ND
bis(2-Chloroethyl)ether		ND	ND	ND	ND	ND
2-Chlorophenol		ND	ND	ND	ND	ND
1,3-Dichlorobenzene		ND	ND	ND	ND	ND
1,4-Dichlorobenzene		ND	ND	ND	ND	ND
Benzyl Alcohol		ND	ND	ND	ND	ND
1,2-Dichlorobenzene		ND	ND	ND	ND	ND
2-Methylphenol		ND	ND	ND	ND	ND
bis(2-Chloroisopropyl)ether		ND	ND	ND	ND	ND
4-Methylphenol		ND	ND	ND	ND	ND
N-Nitroso-n-Dipropylamine		ND	ND	ND	ND	ND
Hexachloroethane		ND	ND	ND	ND	ND
Nitrobenzene		ND	ND	ND	ND	ND
Isophorone		ND	ND	ND	ND	ND
2-Nitrophenol		ND	ND	ND	ND	ND
2,4-Dichlorophenol		ND	ND	ND	ND	ND
Benzoic Acid		ND	ND	ND	ND	ND
bis-(2-Chloroethoxy)methane		ND	ND	ND	ND	ND
2,4-Dichlorophenol		ND	ND	ND	ND	ND
1,2,4-Trichlorophenol		ND	ND	ND	ND	ND
Naphthalene		ND	ND	ND	ND	ND
4-Chloroaniline		ND	ND	ND	ND	ND
Hexachlorobutadiene		ND	ND	ND	ND	ND
4-Chloro-3-methylphenol		ND	ND	ND	ND	ND
2-Methylnaphathalene		ND	ND	ND	ND	ND
Hexachlorocyclopentadiene		ND	ND	ND	ND	ND
2,4,6-Trichlorophenol		ND	ND	ND	ND	ND
2,4,5-Trichlorophenol		ND	ND	ND	ND	ND
2-Chloronaphthalene		ND	ND	ND	ND	ND
2-Nitroaniline		ND	ND	ND	ND	ND
Dimethyl Phthalate		ND	ND	ND	ND	ND
Acenaphthylene		ND	ND	ND	ND	ND
3-Nitroaniline		ND	ND	ND	ND	ND
Acenaphthene		ND	ND	ND	ND	ND

µg/L - Micrograms per liter

J - Estimated value

ND - Not detected

SAUGET Analytical Data
Site Area 1 Private Wells

GROUND WATER SAMPLES
Base Neutrals/Acids (µg/L)
Collected by Ecology & Environment, Inc. (3/87)

	Sample Number	DC-GW-52	DC-GW-53	DC-GW-54	DC-GW-55	Maximum
	Well Number	WRIGHT	SETTLES	SCHMIDT	McDONALD	Concentration
	Date Collected	03/26/87	03/26/87	03/26/87	03/26/87	Detected
BNAs						
2,4-Dinitrophenol		ND	ND	ND	ND	ND
4-Nitrophenol		ND	ND	ND	ND	ND
Dibenzofuran		ND	ND	ND	ND	ND
2,4-Dinitrotoluene		ND	ND	ND	ND	ND
2,6-Dinitrotoluene		ND	ND	ND	ND	ND
Diethylphthalate		ND	ND	ND	ND	ND
4-Chlorophenyl-Phenylether		ND	ND	ND	ND	ND
Fluorene		ND	ND	ND	ND	ND
4-Nitroaniline		ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol		ND	ND	ND	ND	ND
N-Nitrosodiphenylamine		ND	ND	ND	ND	ND
4-Bromophenyl-phenylether		ND	ND	ND	ND	ND
Hexachlorobenzene		ND	ND	ND	ND	ND
Pentachlorophenol		ND	ND	ND	ND	ND
Phenanthrene		ND	ND	ND	ND	ND
Anthracene		ND	ND	ND	ND	ND
Di-n-butly phthalate		ND	ND	ND	ND	ND
Fluoranthene		ND	ND	ND	ND	ND
Pyrene		ND	ND	ND	ND	ND
Butyl Benzyl phthalate		ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine		ND	ND	ND	ND	ND
Benzo (a)anthracene		ND	ND	ND	ND	ND
bis(2-ethylhexyl)phthalate		ND	ND	ND	ND	ND
Chrysene		ND	ND	ND	ND	ND
Di-n-octyl phthalate		2 J	ND	2 J	4 J	4 J
Benzo(b)fluoranthene		ND	ND	ND	ND	ND
Benzo(k)fluoranthene		ND	ND	ND	ND	ND
Benzo (a)pyrene		ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene		ND	ND	ND	ND	ND
Benzo(g,h,i)perylene		ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene		ND	ND	ND	ND	ND

µg/L - Micrograms per liter
J - Estimated value
ND - Not detected

SAUGET Analytical Data
Site Area 1 Private Wells

GROUND WATER SAMPLES
Pesticides/PCBs (µg/L)
Collected by Ecology & Environment, Inc. (3/87)

	Sample Number	DC-GW-52	DC-GW-53	DC-GW-54	DC-GW-55	Maximum
	Well Number	WRIGHT	SETTLES	SCHMIDT	McDONALD	Concentration
	Date Collected	03/26/87	03/26/87	03/26/87	03/26/87	Detected
Pesticides/PCBs						
Alpha-BHC		ND	ND	ND	ND	ND
Beta-BHC		ND	ND	ND	ND	ND
Delta-BHC		ND	ND	ND	ND	ND
Gamma-BHC (Lindane)		ND	ND	ND	ND	ND
Heptachlor		ND	ND	ND	ND	ND
Aldrin		ND	ND	ND	ND	ND
Heptachlor Epoxide		ND	ND	ND	ND	ND
Endosulfan I		ND	ND	ND	ND	ND
Dieldrin		ND	ND	ND	ND	ND
4,4'-DDE		ND	ND	ND	ND	ND
Endrin		ND	ND	ND	ND	ND
Endosulfan II		ND	ND	ND	ND	ND
4,4'-DDD		ND	ND	ND	ND	ND
Endosulfan sulfate		ND	ND	ND	ND	ND
4,4'-DDT		ND	ND	ND	ND	ND
Methoxychlor		ND	ND	ND	ND	ND
Endrin Ketone		ND	ND	ND	ND	ND
Chlordane		ND	ND	ND	ND	ND
Toxaphene		ND	ND	ND	ND	ND
Aroclor-1016		ND	ND	ND	ND	ND
Aroclor-1221		ND	ND	ND	ND	ND
Aroclor-1232		ND	ND	ND	ND	ND
Aroclor-1242		ND	ND	ND	ND	ND
Aroclor-1248		ND	ND	ND	ND	ND
Aroclor-1254		ND	ND	ND	ND	ND
Aroclor-1260		ND	ND	ND	ND	ND

µg/L - Micrograms per liter
ND - Not detected

SAUGET Analytical Data
Site Area 1 Private Wells

GROUND WATER SAMPLES
Total Metals (µg/L)
Collected by Ecology & Environment, Inc. (3/87)

	Sample Number	DC-GW-52	DC-GW-53	DC-GW-54	DC-GW-55	Maximum
	Well Number	WRIGHT	SETTLES	SCHMIDT	McDONALD	Concentration
	Date Collected	03/26/87	03/26/87	03/26/87	03/26/87	Detected
Total Metals						
Aluminum		ND	ND	ND	ND	ND
Antimony		ND	ND	ND	ND	ND
Arsenic		ND	ND	**11**	**26**	**26**
Barium		**[73]**	**[89]**	**292**	**[117]**	**117**
Beryllium		ND	ND	ND	ND	ND
Boron		ND	ND	ND	ND	ND
Cadmium		ND	ND	ND	ND	ND
Chromium		ND	ND	ND	ND	ND
Cobalt		ND	ND	ND	ND	ND
Copper		ND	**[10]**	**115**	ND	**115**
Iron		**2990**	**4600**	**21600**	**10600**	**21600**
Lead		ND	**12 R**	**18 R**	ND	**18 R**
Manganese		**1060**	**665**	**1660**	**257**	**1660**
Mercury		ND	ND	**0.2**	ND	**0.2**
Nickel		ND	ND	ND	ND	ND
Selenium		ND	ND	ND	ND	ND
Silver		ND	ND	ND	ND	ND
Thallium		ND	ND	ND	ND	ND
Tin		ND	ND	ND	ND	ND
Vanadium		ND	ND	ND	ND	ND
Zinc		**4140 R**	**2000 R**	**377 R**	**1350 R**	**4140 R**
Cyanide		ND	ND	ND	ND	ND

µg/L - Micrograms per liter
ND - Not detected
R - Spike sample recovery not within control limits.

SAUGET Analytical Data
Area 1- Groundwater Monitoring Survey

GROUNDWATER SAMPLES
Organics (μg/L)
Collected by IEPA

	Sample Number	S01	S02	S03	S04	S05	S06	R09	Maximum
	Date Collected	3/3/82	3/3/82	3/3/82	3/3/82	3/3/82	3/3/82	3/3/82	Concentration
Organics								Blank	
bis (2ethylhexyl)phthalate		64	62			19	**		64
di-n-butylphthalate		**	**	**	**		**		ND
diethylphthalate		**	**	**	**			**	ND
3,4-benzofluoranthene*		**							ND
Benzo(k)fluoranthene*		**							ND
Methylene Chloride		16	16	2300	3100	990	2000	19	3100
di-n-octylphthalate			X	X					ND
1,2-dichlorobenzene					**				ND
1,4-dichlorobenzene					**				ND
butyl benzyl phthalate					**			**	ND
Chlorobenzene					**	**			ND
heptachlor					0.11 ***	0.14 ***			0.14 ***
beta-BHC					0.18 ***	0.3 ***	4.04 ***		4.04 ***
gamma-BHC					0.16 ***	0.25 ***			0.25 ***
aldrin					0.17 ***				0.17 ***
alpha-BHC						0.18 ***	0.25 ***		0.25 ***
4,4-DDE							0.11 ***		0.11 ***
heptachlor epoxide							1.46 ***		1.46 ***
delta-BHC							0.95 ***		0.95 ***

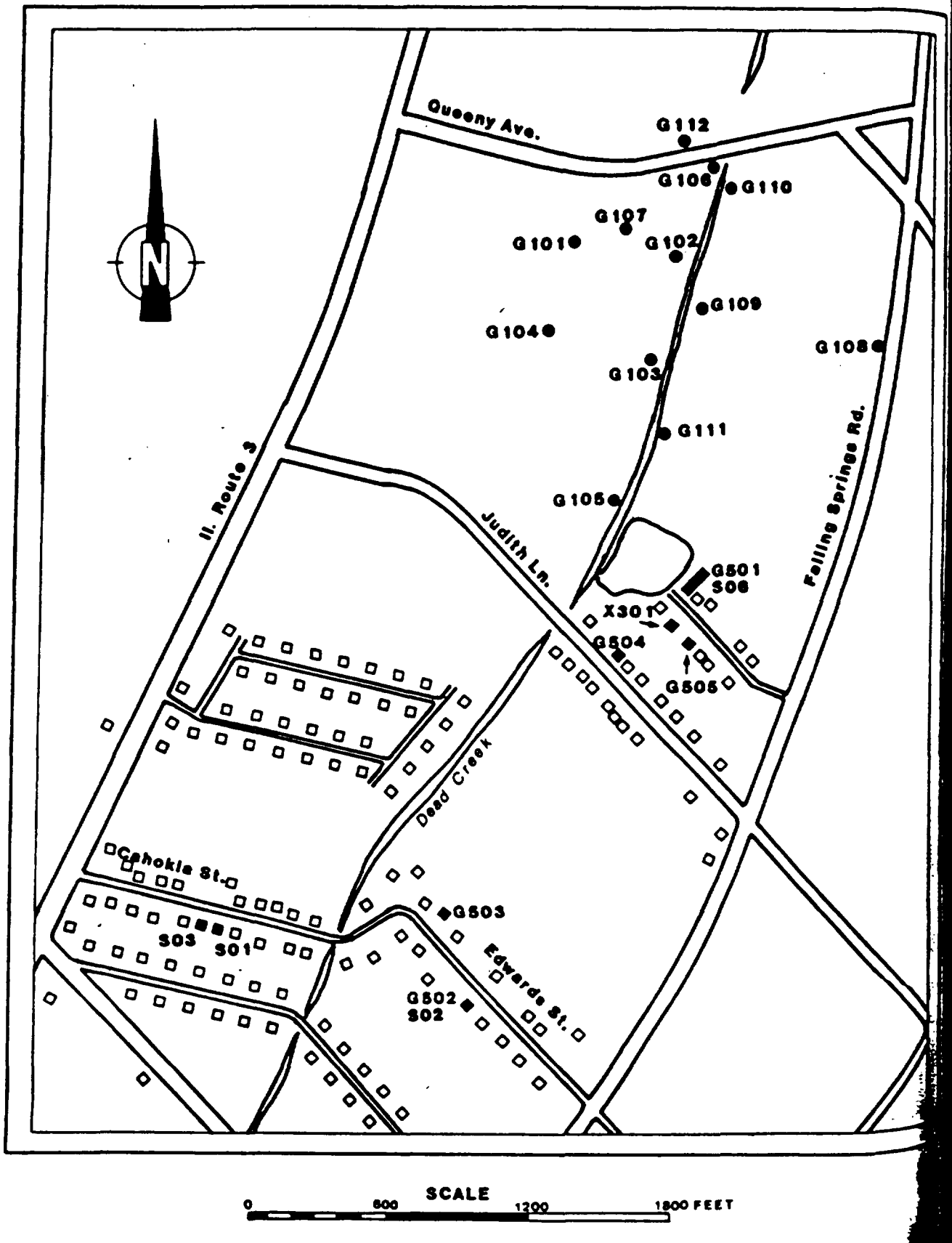
μg/L - Micrograms per liter
ND - Not detected
* Coelute
** Less than 10 mg/l
*** Not confirmed by GCMS
X Results unacceptable due to bad spike recovery of blind sample

SAUGET Analytical Data
Area 1- Groundwater Monitoring Survey

GROUNDWATER SAMPLES
Metals (µg/L)
Collected by IEPA

	Sample Number	S01	S02	S03	S04	S05	S06	R09	Maximun
	Date Collected	3/3/82	3/3/82	3/3/82	3/3/82	3/3/82	3/3/82	3/3/82	Detected
Total Metals								Blank	
Total Aluminum		<200	410	390	<200	940	1200	<200	1200
Arsenic		11	<10	<10	29	<10	<10	<10	29
Barium		<100	<100	<100	<100	<100	<100	<100	ND
Boron		10500	11000	8000	1800	140	110	<100	11000
Cadmium		4.2	14	31	5.3	<1	2.8	<1	31
Chromium		12	<10	<10	<10	<10	<10	<10	12
Cobalt		62	70	82	95	<50	<50	<50	95
Copper		65	<50	<50	<50	<50	<50	<50	65
Iron		65000	31000	38000	28000	530	250	<50	65000
Lead		570	97	74	9	11	10	<5	570
Manganese		1600	1100	1500	5100	460	80	<15	5100
Mercury*		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	ND
Nickel		<40	<40	<40	140	<40	<40	<40	140
Selenium		<2	<2	<2	<2	<2	<2	<2	ND
Silver		<10	<10	<10	<10	<10	<10	<10	ND
Tin		<20	<20	<20	<20	<20	<20	<20	ND
Vanadium		<200	<200	<200	<200	<200	<200	<200	ND
Zinc		107000	109000	40000	1900	260	350	<10	109000
Antimony		<20	<20	<20	<20	<20	<20	<20	ND
Thallium		<10	<10	<10	<10	<10	<10	<10	ND
Beryllium		<5	<5	<5	<5	<5	<5	<5	ND
Mercury**		0.1	0.4	0.4	0.2	0.1	<0.1	<0.1	0.4

µg/L - Micrograms per liter.
ND - Not detected
* Cal Analytical Labs Test
** CRL Lab Test



FOR ANALYSIS OF GROUNDWATER SAMPLES FROM THE IEPA MONITORING WELLS (COLLECTED 10-23-80)

FIGURE B-2
LOCATIONS OF IEPA MONITORING WELLS AND RESIDENTIAL WELLS SAMPLED IN THE VICINITY OF DEAD CREEK

SAUGET Analytical Data

Sauget Sites Area 1

MONITORING WELL SAMPLES

Total Metals (mg/l)

Collected by IEPA

	Sample Number	G501	G502	G503	G504	G505	X301	Maximum
	Date Collected	9/16/80	9/16/80	9/16/80	9/23/80	6/8/83	1/5/83	Concentration
Metals								Detected
Arsenic		0.008	0.004	0.001	ND	0.01	0.017	0.017
Barium		0.2	0.16	0.39	0.05	0.4	1.1	1.1
Boron		0.28	0.27	0.25	0.58	0.4	0.3	0.58
Cadmium		ND	ND	ND	ND	ND	ND	ND
Chromium Total		ND	ND	ND	ND	ND	ND	ND
Copper		0.02	ND	ND	0.06	0.01	0.08	0.08
Iron		4.6	19	17.7	0.73	26	31	31
Lead		ND	ND	ND	ND	ND	0.08	0.08
Magnesium		33	39	36	30	35.3	54	54
Manganese		1.02	1.26	0.79	0.65	1.3	1.49	1.49
Mercury		ND	ND	ND	0.0001	ND	ND	0.0001
Nickel		ND	ND	ND	0.02	ND	0.1	0.1
Phosphorus		ND	ND	ND	0.02	0.62	1.2	1.2
Potassium		6.6	5.7	4.5	6	6.2	6.4	6.6
Silver		ND	ND	ND	ND	ND	ND	ND
Sodium		21	24	12	26	15.2	19	26
Zinc		0.85	ND	0.18	0.8	ND	0.7	0.85

mg/kg - Milligrams per kilogram.

ND - Not detected

Sample X301 was collected from basement seepage

SAUGET Analytical Data
Sauget Sites Area 1

MONITORING WELL SAMPLES
Pesticides/PCBs (mg/l)
Collected by IEPA

	Sample Number		G501	G502	G503	G504	G505	X301	Maximum
	Date Collected		9/16/80	9/16/80	9/16/80	9/23/80	6/8/83	1/5/83	Concentration
Pesticides/PCBs									Detected
PCBs			NA	NA	NA	ND	ND	ND	ND
Chlordane (ppb)			NA	NA	NA	NA	ND	0.13	0.13

mg/kg - Milligrams per kilogram.

NA - Parameter not analyzed

ND - Not detected.

ppb - Parts per billion

Sample X301 was collected from basement seepage

SAUGET Analytical Data

Sauget Sites Area 1

GROUNDWATER SAMPLES (μg/L)

Collected by IEPA

Sample Number	G204	G201	G205	Maximum
Well Number	H. KEARBY	B. SETTLE	W. ALLEN	Concentration
Date Collected	3/91	3/91	3/91	Detected
VOLATILES				
Chlorobenzene	ND	ND	ND	ND
SEMIVOLATILES				
Pyrene	ND	ND	ND	ND
Benzo(b)fluoranthene	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND
PESTICIDES/PCB's				
4,4'-DDE	ND	ND	ND	ND
Endrin	ND	ND	ND	ND
Endosulfan II	ND	ND	ND	ND
Gamma-Chlorodane	ND	ND	5.02	5.02
Aroclor-1254	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND
INORGANICS				
Arsenic	ND	ND	ND	ND
Barium	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND
Calcium	ND	ND	11900	11900
Chromium	ND	ND	ND	ND
Cobalt	ND	6.2	ND	6.2
Copper	ND	ND	75	75
Lead	3.3	ND	11	11
Magnesium	ND	ND	ND	ND
Mercury	ND	ND	ND	ND
Nickel	ND	ND	ND	ND
Zinc	38	680	658	658

μg/L - Micrograms per liter.
ND - Not detected.

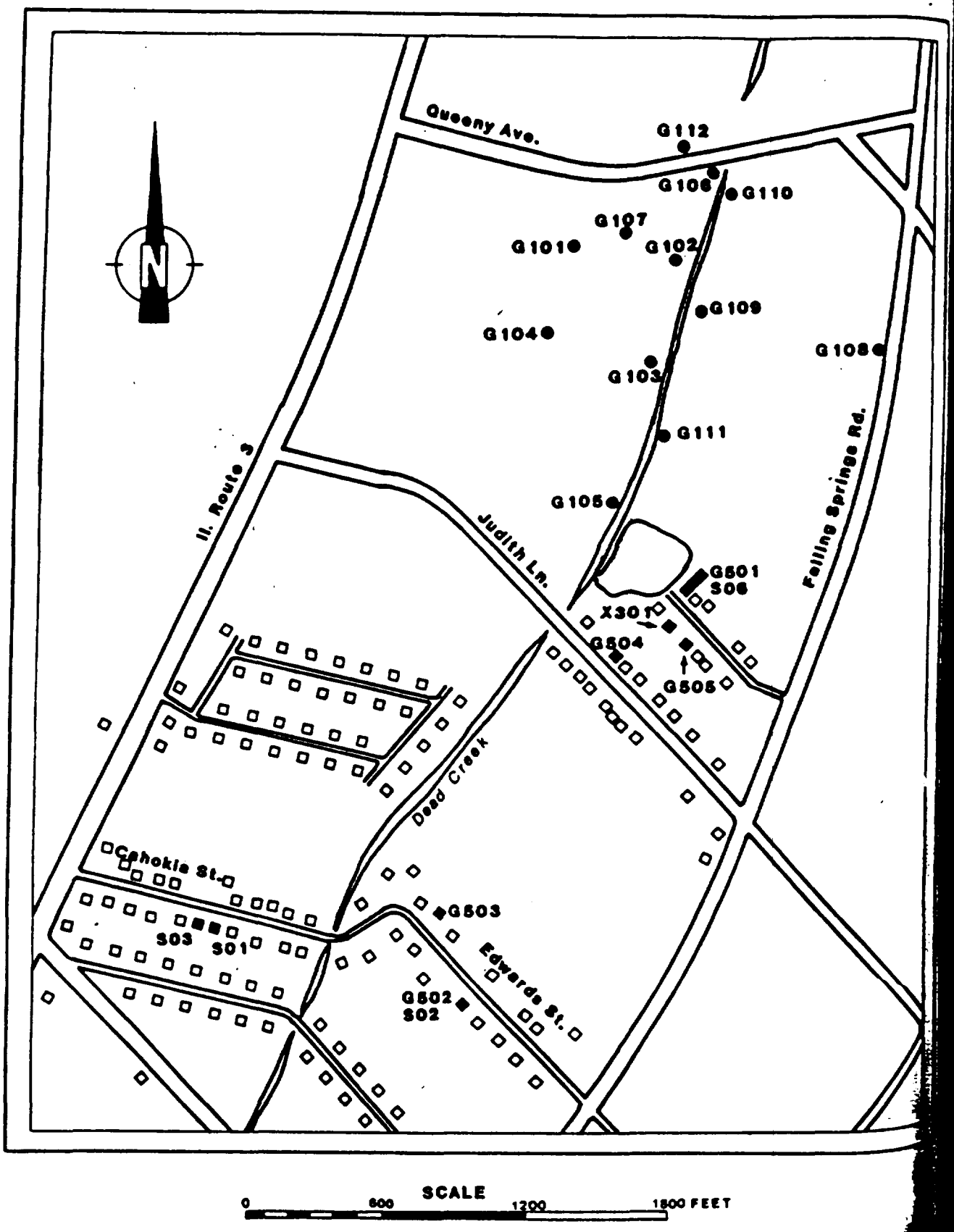


FIGURE B-2
LOCATIONS OF IEPA MONITORING WELLS AND RESIDENTIAL WELLS SAMPLED IN THE VICINITY OF DEAD CREEK

SAUGET Analytical Data

Dead Creek - Segment B

WATER SAMPLES

Collected by IEPA and Monsanto Chemical Co. (10/80)

	Sample Number	0100307				Maximum
	Date Collected	10/2/80				Concentration
	Location	Well at Threasa's				Detected
PCBs and Elemental Phosphorus (µg/L)		Greenhouse 101 Walnut				
PCB's (Cl_2 to Cl_6 Homologs)		ND<1				ND
P_4		NA				NA

µg/L - Micrograms per liter

NA - Not Analyzed

ND - Not detected

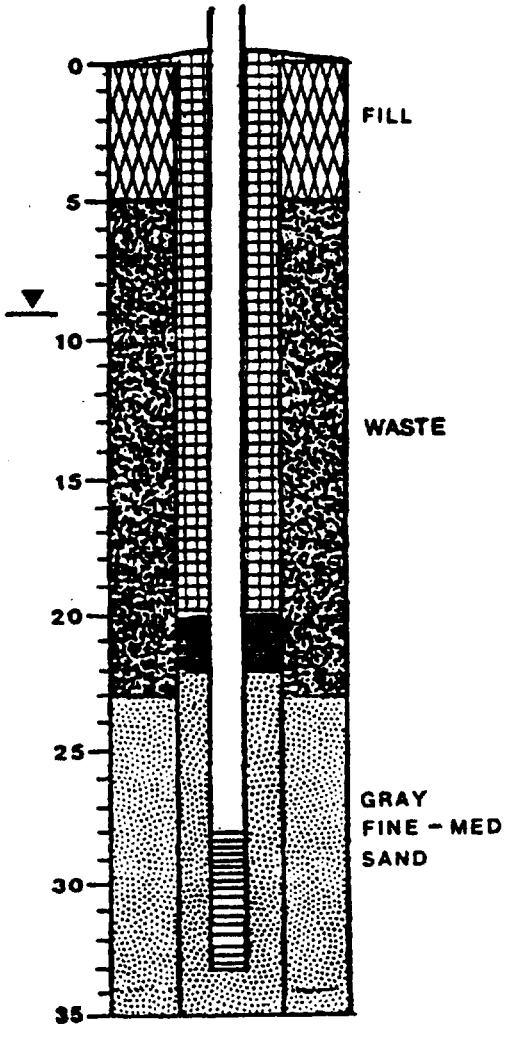
Appendix C

Existing Well Logs

Project Name Dead Creek
Project No. IL 3140
Date Prepared 1-6-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-01



Boring/Well No. H-2/EE-01
Location Site H
Owner IEPA
Top of Inner Casing Elev. 408.84
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 1/5/87,1/6/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers, Rotary

WELL DATA

Hole Diam. 8 in.
Boring Depth 35.0 ft.
Casing and Screen Diam. 2 in.
Screen Interval 28 - 33 ft.
Screen Type stainless steel 0.01" slot
Stickup 2.3 ft.
Well Type monitoring
Well Construction:
Filter Pack 33 - 22 ft.
Seal 22 - 20 ft.
Grout 10 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.41 Date 3-26-87
Static Water Elev. 398.55 Date 5-11-87
Slug Test Yes ____ No X
Test Date
Hydraulic Conductivity
Other ph = 6.8
Cond. = 2600 umhos Temp. = 56° F
Yellow-brown color, turbid

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples Groundwater

Date Sampled 3-17-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes ____ No X
Recipient

Comments Subsurface soil sample from boring 5 - 20' analyzed for HSL compounds.

REMARKS

Strong organic odor

Site Dead Creek Site-H

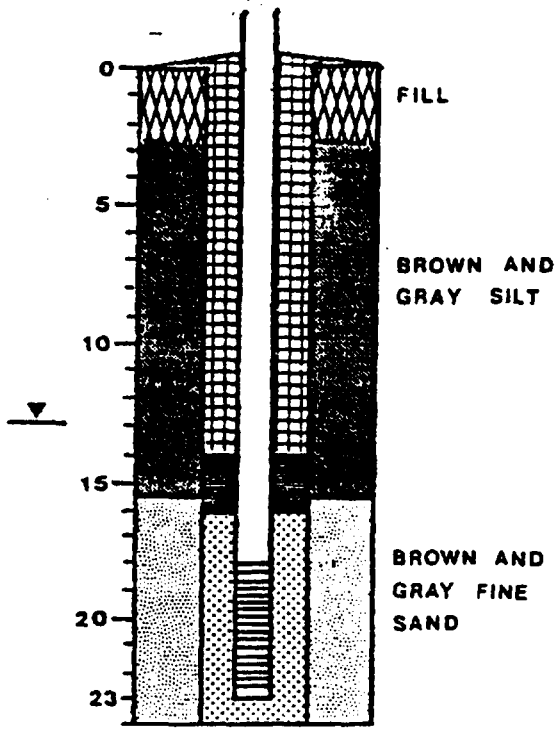
Boring/Well No. H-2/well @ EE-01

Sample Depth	Blow Count	Description
1 - 2.5	3-3-4	0-1.5 FILL consisting of black cinders and small gravel. (dry) 1.5-2.5 FILL consisting of brownish cinders, slag, and medium grain sand. (dry)
3.5 - 5	2-3-3	3.5-4 FILL - same as above. 4-5 FILL consisting of dark gray SILT. Soft and stained. Little of fine grain sand. (very moist)
6 - 7.5	35-17-19	WASTE steel and a coal-like dense black flaky substance.
8.5 - 10	2-3-3	WASTE - Wood and paper products, heavy black staining.
11 - 12.5	3-3-5	WASTE - same as above.
13.5 - 15	2-3-5	WASTE consisting of black (stained) silt, medium grain sand and wood. (wet)
16 - 17.5	4-8-9	WASTE - Wood chips.
18.5 - 20	5-7-14	WASTE - same as above.
21 - 22.5	9-10-13	WASTE - same as above.
		WASTE discontinues @ approx. 23'.
23.5 - 25	2-1-6	Firm brownish-gray fine-medium grain SAND. Black staining throughout. Well-rounded and well sorted. Rounded to subangular. (wet)
33.5 - 35	9-10-12	Dense gray fine-medium grain SAND. Trace of coarse grain sand. Fairly well sorted and rounded to subangular. (wet)
		E.O.B. @ 35

Project Name Dead Creek
Project No. IL 3140
Date Prepared 1-6-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-02



Boring/Well No. H-3/EE-02
Location Site H
Owner IEPA
Top of Inner Casing Elev. 409.91
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 1/6/87,1/6/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 23.0 ft.
Casing and Screen Diam. 2 in.
Screen Interval 18 - 23 ft.
Screen Type stainless steel 0.01" slot
Stickup 2.25 ft.
Well Type monitoring
Well Construction:
Filter Pack 23 - 16 ft.
Seal 16 - 14 ft.
Grout 14 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.58 Date 3-26-87
Static Water Elev. 398.61 Date 5-11-87
Slug Test Yes ____ No X
Test Date
Hydraulic Conductivity
Other pH = 4.0
Cond. = 4200 umhos Temp. = 54 F
Yellowish

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-17-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes ____ No X
Recipient

Comments Subsurface soil samples from boring 10 - 20' analyzed for HSL compounds.

REMARKS

Slight organic odor

Site Dead Creek Site-H

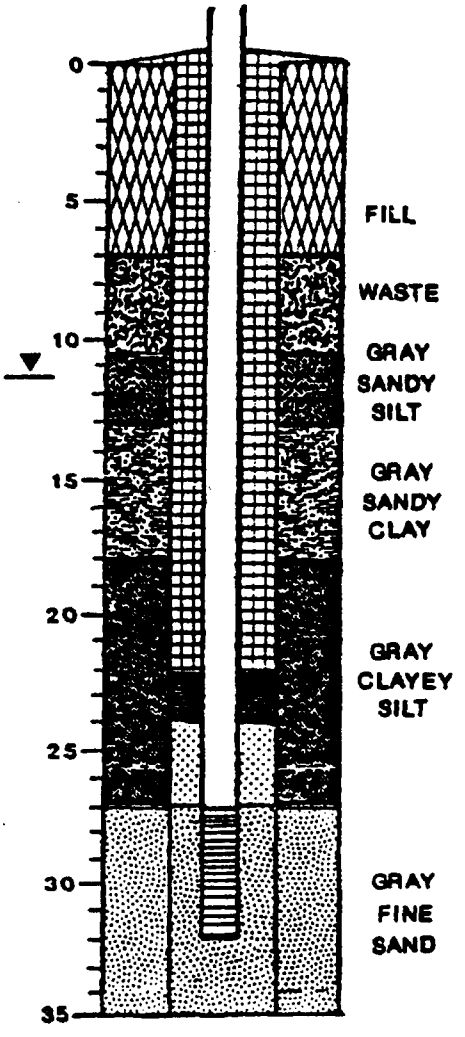
Boring/Well No. H-3/well #EE-02

Sample Depth	Blow Count	Description
1 - 2.5	6-10-13	0-2.5 FILL consisting of dense brown sandy CLAY including small gravel, cinders, and brick fragments.
3.5 - 5	2-3-4	Firm brown SILT and silty CLAY. Trace of fine grain sand. (moist).
6 - 7.5	2-4-6	Firm brown to yellowish brown very sandy SILT. Some fine grain sand and trace of silty clay. (moist)
8.5 - 10	2-2-2	Same as above. (very moist)
11 - 12.5	5-11-14	Dense brownish-gray silt and fine grain SAND. (wet)
13.5 - 15	7-7-7	Same as above.
		Water table @ approx. 13 feet.
16 - 17.5	9-10-20	Very dense gray very silty fine grain SAND. Some silt. Wet.
18.5 - 20	9-10-11	(From 18 to 23 feet) tan dense very fine grain SAND. Very well sorted. Wet.
		E.O.B. @ 23 feet.

Project Name Dead Creek
Project No. IL 3140
Date Prepared 1-12-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-03



Boring/Well No. H-8/EE-03
Location Site H
Owner IEPA
Top of Inner Casing Elev. 411.47
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 1/9 & 1/12/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 35.0 ft.
Casing and Screen Diam. 2 in.
Screen Interval 27 - 32 ft.
Screen Type stainless steel 0.01" slot
Stickup 2.36
Well Type monitoring
Well Construction:
Filter Pack 32 - 24 ft.
Seal 24 - 22 ft.
Grout 22 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 394.74 Date 3-26-87
Static Water Elev. 398.72 Date 5-11-87
Slug Test Yes X No
Test Date 5-11-87
Hydraulic Conductivity 10 x 10^{-3} cm/sec
Other pH = 7.3
Cond. = 2800 umhos Temp. = 56° F
Yellowish

WATER QUALITY

Samples Taken Yes X No
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-17-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes No X
Recipient

Comments Subsurface soil samples from boring 5 - 15' analyzed for HSL compounds.

REMARKS

Slight organic odor

MCD 6565896

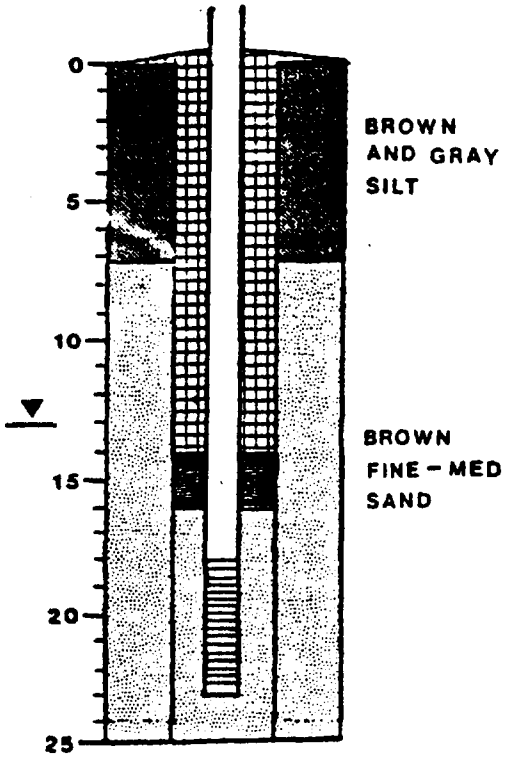
Site Dead Creek Site-H Boring/Well No. H-8/well #EE-03

Sample Depth	Blow Count	Description
		0-1.5 Black cinders
1 - 2.5	4-5-7	1.5-2.5 Brown and gray silty CLAY. Trace of small gravel, brick, and concrete fragments.
3.5 - 5	4-5-1	FILL same as above.
6 - 7.5	8-12-11	FILL consisting of black and gray silty CLAY (possibly stained). 2 inches of black granular material and small spherical beads @ 7'. WASTE (moist)
8.5 - 10	30/2	WASTE - no recovery (rod bounced, probably rubber material).
		Water @ 11' while drilling.
11 - 12.5	1-1-1	Gray very sandy SILT. Some fine grain sand. Wet. Slight chemical odor.
13.5 - 15	2-3-5	Gray firm very sandy silty CLAY. Some fine grain sand and silt. Horizontally bedded and slightly varved. Occasional fractures containing iron-like staining. Moist.
16 - 17.5	1-2-3	Same as above; bedding is 1/8" to 1/4" thick. Occasional fractures and root trails or burrows.
18.5 - 20	1-1-1	Gray loose very clayey SILT, some fine grain sand. No bedding. Wet.
21 - 22.5	1-2-3	Same as above; slightly bedded (1/8") and slightly varved.
23.5 - 25	1-1-1	Same as above.
26 - 27.5	3-4-7	Same as above. (Fine grain sand in tip of spoon).
28.5 - 30	6-6-10	From 27' dark gray fine grain SAND. Wet. Slight chemical odor.
33.5 -35	3-9-9	Firm gray fine to coarse grain SAND. Wet. Well rounded.
		E.O.B. @ 35'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 1-13-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-04



Boring/Well No. H-9/EE-04
Location Site H
Owner IEPA
Top of Inner Casing Elev. 413.26
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 1/13, 1/13/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 25 ft.
Casing and Screen Diam. 2 in.
Screen Interval 18 - 23 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.93 ft.
Well Type monitoring
Well Construction:
Filter Pack 23 - 16 ft.
Seal 16 - 14 ft.
Grout 14 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 398.07 Date 3-26-87
Static Water Elev. 399.01 Date 5-11-87
Slug Test Yes X No
Test Date 5-12-87
Hydraulic Conductivity 5.2 x 10^{-4} cm/sec
Other pH = 7.2
Cond. = 2000 umhos Temp. = 58° F
Clear-yellow

WATER QUALITY

Samples Taken Yes X No
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-17-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes No X
Recipient

Comments Subsurface soil sample from boring from 15 - 25' analyzed for HSL organics

REMARKS

Site Dead Creek Site-H

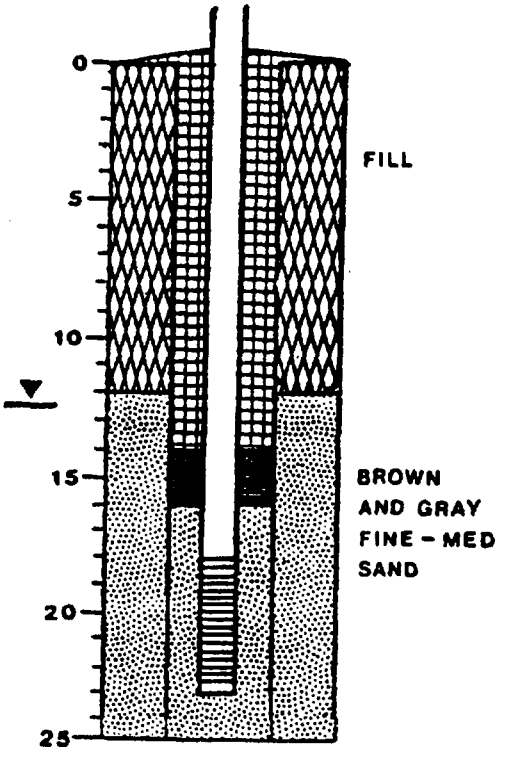
Boring/Well No. H-9/well #EE-04

Sample Depth	Blow Count	Description
1 - 2.5	5-5-3	0-2' Firm brownish-gray clayey SILT. Trace of fine grain sand. Moist. 2-2.5' Firm brown sandy SILT. Some fine grain sand. Dry.
3.5 - 5	3-4-6	Stiff brown and gray (mottled) very silty CLAY. Trace of fine grain sand. Occasional clayey silt layers (.2"). Moist.
6 - 7.5	3-5-8	Same as above; becomes increasingly siltier at 7' then grades into brown very fine SAND at 7 1/4'. Trace of silt. Dry.
8.5 - 10	3-5-7	Brown very fine grain SAND. Trace of silt. Dry.
11 - 12.5	2-2-5	Same as above; a 4 inch silty clay layer appears at 12'. Trace of fine grain sand.
13.5 - 15	2-6-8	Brown fine grain SAND. Wet.
16 - 17.5	2-6-7	Brown fine grain SAND. Some medium grain sand. Wet.
18.5 - 20	1-1-3	Brown medium grain SAND. Trace of coarse grain sand. Wet.
23.5 - 25	7-14-11	Brown medium grain SAND. Trace of coarse grain sand and small gravel. Wet.
		E.O.B. @ 25'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 1-14-87
Prepared by Tim Maley

Depth (ft) Description

EE-05



Boring/Well No. G-2/EE-05
Location Site G
Owner IEPA
Top of Inner Casing Elev. 411.36
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 1/14, 1/14/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 25 ft.
Casing and Screen Diam. 2 in.
Screen Interval 18 - 23 ft.
Screen Type stainless steel 0.01" slot
Stickup 2.3 ft.
Well Type monitoring
Well Construction:
Filter Pack 23 - 16 ft.
Seal 16 - 14 ft.
Grout 14 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 396.69 Date 3-26-87
Static Water Elev. 398.17 Date 5-11-87
Slug Test Yes ____ No X
Test Date
Hydraulic Conductivity
Other pH = 5.2
Cond. = 2200 umhos Temp. = 56° F

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-18-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes X No ____
Recipient Enviropact

Comments Subsurface soil sample from boring 5 - 15' analyzed for HSL compounds.

REMARKS

Slight organic odor

MCO 6565863

Site Dead Creek Site-G

Boring/Well No. G-2/Well #EE-05

Sample Depth	Blow Count	Description
1 - 2.5	3-15-6	FILL consisting of black sandy CLAY with a variety of debris materials including slag, wood, crushed limestone, gravel, and iron fragments (dry).
3.5 - 5	3-5-3	FILL same as above (dry).
6 - 7.5	1-1-1	FILL consisting of brown silty CLAY. Trace of coarse grain sand and paper products (dry).
8.5 - 10	1-0-1	FILL consisting of light gray silty CLAY. Trace of asphalt and a purple paint-like residue substance (dry).
11 - 12.5	1-3-5	FILL (to 12 feet) consisting of dark brown silty CLAY. From 12 feet is gray medium grain sand (moist).
13.5 - 15	3-4-5	Brown-gray medium grain SAND (wet).
16 - 17.5	2-5-10	Brown fine grain SAND. Trace of silt (wet).
18.5 - 20	1-1-5	Same as above. With less silt.
23.5 - 25	7-14-18	Gray fine grain SAND. Trace of silt (wet).
		E.O.B. @ 25

Site Dead Creek Site-I

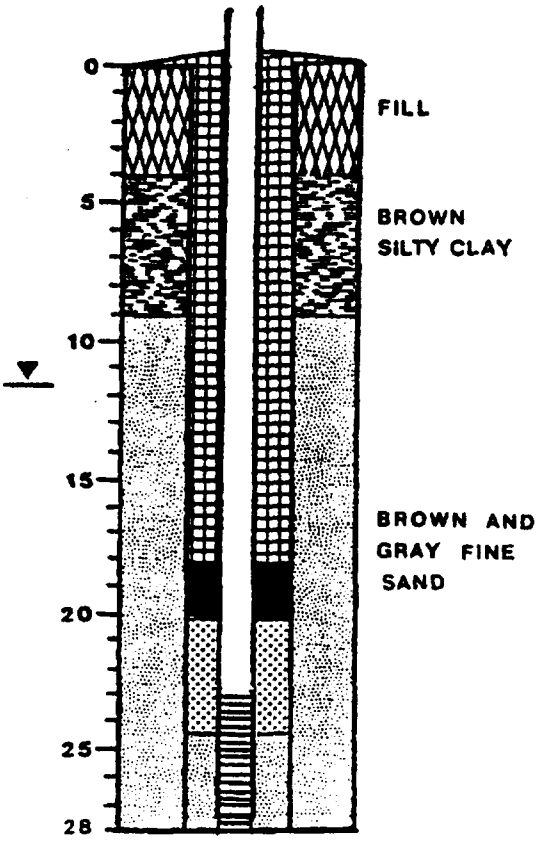
Boring/Well No. I-1/Well # EE-12

Sample Depth	Blow Count	Description
		Crushed limestone and gravel on surface - parking lot for semi-trailers.
1 - 2.5	5-6-7	FILL consisting of brown-black sandy CLAY including a mixture of asphalt, fine to coarse grain sand, large gravel, and slag. Dry.
3.5 - 5	3-4-6	WASTE consisting of brown-black gravelly SAND including slag, stained paper and wood products, and a white gravelly substance. Dry.
6 - 7.5	3-5-4	WASTE. Same as above; with more slag and small spherical beads. Dry.
8.5 - 10	7-2-1	WASTE - poor recovery; probably same as above.
11 - 12.5	4-2-1	WASTE - same as above; wet.
13.5 - 15	7-10-14	WASTE consisting of black (oily stained) sludge-like material including wood chips, coarse grain sand, and concrete fragments. Wet.
16 - 17.5	1-3-4	WASTE. Same as above; with brick and concrete fragments, sand and gravel, and soft clay. Wet.
18.5 - 20	4-3-1	WASTE. Same as above. Fill material discontinues @ 21'.
21 - 22.5	0-0-2	21-22' Dark gray fine grain SAND. Some black staining. Wet. 22-22.5 Dark gray silty CLAY. Moist.
23.5 - 25	2-2-2	Dark gray silty CLAY. Moist.
26 - 27.5	0-0-1	Dark gray to black fine grain SAND. Trace of silt and medium grain SAND. Wet.
28.5 - 30	6-8-10	Dark gray medium to coarse grain SAND. Wet.
31 - 32.5	7-8-9	Same as above; with a trace of small gravel. Wet.
		E.O.B. @ 33.5'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 1-29-87
Prepared by Tim Maley

Depth (ft) Description

EE - 13



Boring/Well No. I-4/EE-13
Location Site I
Owner IEPA
Top of Inner Casing Elev. 409.16
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 1/29,1/29/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 28.0 ft.
Casing and Screen Diam. 2 in.
Screen Interval 23 - 28 ft.
Screen Type stainless steel 0.01" slot
Stickup 0.52 ft.
Well Type monitoring
Well Construction:
Filter Pack 28 - 20 ft.
Seal 20 - 18 ft.
Grout 18 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.47 Date 3-26-87
Static Water Elev. 398.75 Date 5-11-87
Slug Test Yes X No
Test Date 5-12-87
Hydraulic Conductivity 1.3 x 10^{-4} cm/sec
Other pH = 7.2
Cond. = 1800 umhos Temp. = 56° F
Clear to yellowish

WATER QUALITY

Samples Taken Yes X No
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-23-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes X No
Recipient Sverdrup, Inc. for Cerro Copper

Comments

REMARKS

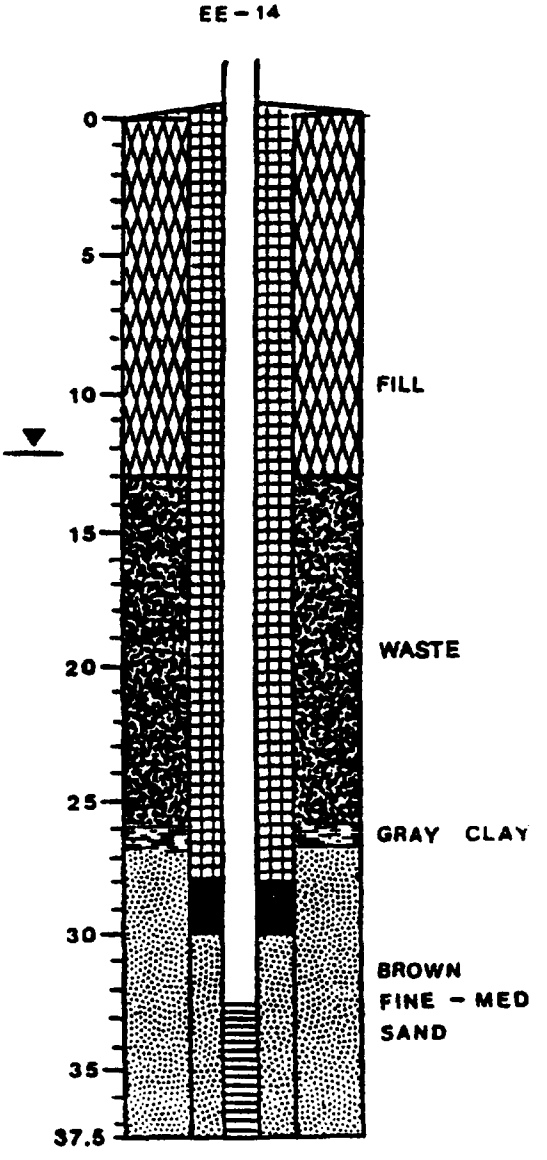
Site Dead Creek Site-I

Boring/Well No. I-4/Well # EE-13

Sample Depth	Blow Count	Description
		Fill on surface.
1 - 2.5	8-7-50	FILL consisting of brown and black sandy CLAY, including a mixture of crushed limestone, small to medium gravel, and concrete fragments.
		Fill discontinues @ approx. 4'.
3.5 - 5	3-4-4	From 4', brown very silty CLAY. Dry.
6 - 7.5	3-4-5	Brown silty CLAY; to 9'.
8.5 - 10	2-3-2	From 9', brown very fine grain SAND. Some silt. Thinly bedded. Water @ 9.5'.
11 - 12.5	1-3-2	Same as above.
13.5 - 15	1-1-1	Same as above; some interbedding of siltier material. Wet.
16 - 17.5	1-2-3	Same as above; to 19'.
18.5 - 20	1-2-3	From 19', brown (turning gray) SILT. Wet.
21 - 22.5	1-2-2	Gray fine grain SAND. Wet.
23.5 - 25	0-1-0	Same as above.
26 - 27.5	0-1-2	Same as above.
		E.O.B. @ 28'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 1-30-87
Prepared by Tim Maley

Depth (ft) Description



Boring/Well No. I-5/EE-14
Location Site I
Owner IEPA
Top of Inner Casing Elev. 410.95
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 1/30, 1/30/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers, Rotary

WELL DATA

Hole Diam. 8 in.
Boring Depth 37.5 ft.
Casing and Screen Diam. 2 in.
Screen Interval 32.5 - 37.5 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.56 ft.
Well Type monitoring
Well Construction:
Filter Pack 37.5 - 30 ft. Natural
Seal 30 - 28 ft.
Grout 28 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.23 Date 3-26-87
Static Water Elev. 398.55 Date 5-11-87
Slug Test Yes ____ No X
Test Date
Hydraulic Conductivity
Other pH = 7.4
Cond. = 3400 umhos Temp. = 56° F
Cloudy, yellowish

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-23-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes X No ____
Recipient Sverdrup, Inc. for Cerro Copper

Comments Subsurface soil samples from boring 5' - 27.5 feet and 28.5 - 37.5 feet analyzed for HSL compounds.

REMARKS

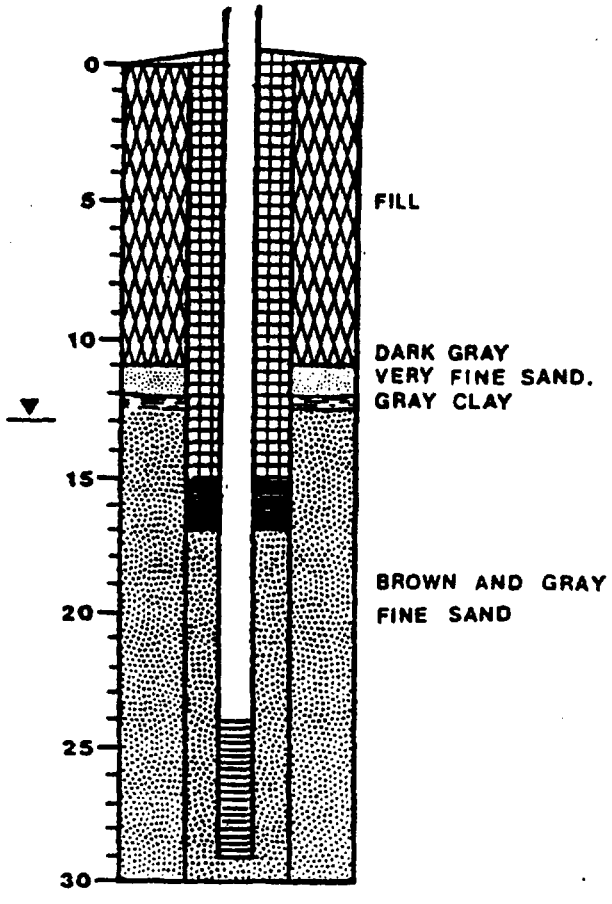
Site Dead Creek Site-I Boring/Well No. I-5/Well #EE-14

Sample Depth	Blow Count	Description
		Crushed limestone parking lot surface.
1 - 2.5	24-00	FILL consisting of dark brown-black sandy CLAY including a mixture of fine to coarse grain sand, limestone fragments, clay, and concrete (large obstruction caused spoon refusal).
3.5 - 5	4-6-8	FILL consisting of black-gray silty CLAY.
6 - 7.5	11-14-8	FILL consisting of light gray-black sandy CLAY including crushed limestone, small to large gravel, fine to coarse grain sand, and wood chips. Dry.
8.5 - 10	4-17-4	FILL - same as above; with some brick fragments.
11 - 12.5	2-2-1	FILL consisting of gray silty CLAY. Some black staining, trace of fill debris including cloth products and cinders.
13.5 - 15	2-2-3	WASTE consisting of black sandy CLAY including a mixture of cinders, slag, small to large gravel, and fine to coarse grain sand. (Moist)
16 - 17.5	4-2-5	No recovery - probably same fill material. Water @ 17.5'.
18.5 - 20	3-5-3	WASTE consisting of black sandy CLAY including some gravel and slag. Wet (with oily sheen).
21 - 22.5	4-1-5	No recovery - probably same fill material.
23.5 - 25	5-9-5	WASTE - same as above. Fill apparently discontinues @ approx. 26'.
26 - 27.5	4-2-3	26-26 3/4' Black-gray-brown silty CLAY then black very fine grain SAND Some silt and black staining. Wet.
28.5 - 30	3-4-3	Black very fine grain SAND. Stained. Wet. From 29-29 1/4' is a gray silty CLAY layer. Then brown fine grain SAND. Slightly stained. Wet. Trace of medium grain sand.
31 - 32.5	2-4-2	Brown fine to medium grain SAND. Wet.
36 - 37.5	8-16-24	Brown medium to coarse grain SAND. Trace of small gravel. Wet. Tip of spoon (37.5') showed dark gray very fine grain SAND. Trace of small gravel.
		E.O.B. @ 37.5'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 2-3-87
Prepared by Tim Maley

Depth (ft) Description

EE-15



Boring/Well No. I-7/EE-15
Location Site I
Owner IEPA
Top of Inner Casing Elev. 406.41
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 2/3/87,2/3/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers, Rotary

WELL DATA

Hole Diam. 8 in.
Boring Depth 30 ft.
Casing and Screen Diam. 2 in.
Screen Interval 24 - 29 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.33 ft.
Well Type monitoring
Well Construction:
Filter Pack 29 - 17 ft. Natural
Seal 17 - 15 ft.
Grout 15 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.63 Date 3-26-87
Static Water Elev. 398.93 Date 5-11-87
Slug Test Yes X No
Test Date 5-12-87
Hydraulic Conductivity 0.47 x10^{-4} cm/sec
Other pH = 7.2
Cond. = 1800 umhos Temp. = 56° F
Yellowish

WATER QUALITY

Samples Taken Yes X No
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-23-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes X No
Recipient Sverdrup, Inc. for Cerro Copper

Comments Subsurface soil samples from boring 3.5 - 12.5 feet and 13.5 - 22.5 feet analyzed for HSL compounds.

REMARKS

Slight odor

Site Dead Creek Site-I

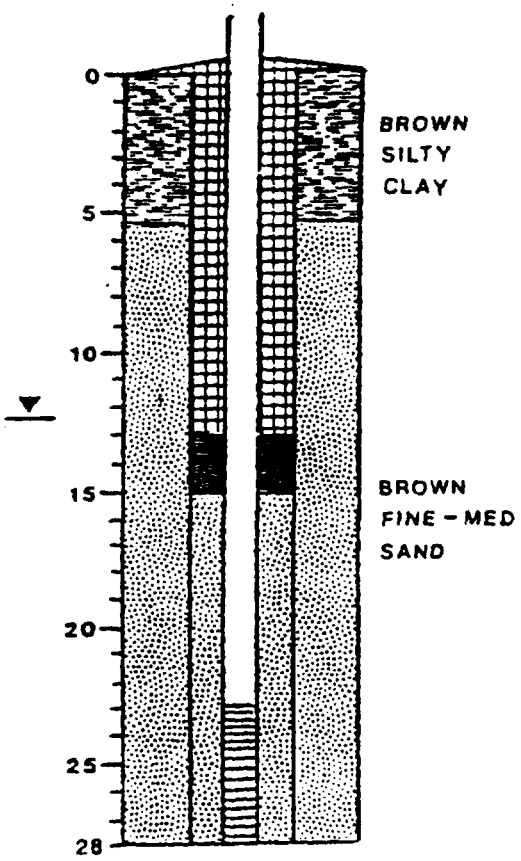
Boring/Well No. I-7/Well #EE-15

Sample Depth	Blow Count	Description
		0-1 Black clayey topsoil
1 - 2.5	3-3-4	FILL consisting of brown-gray silty CLAY. Dry.
3.5 - 5	4-8-4	FILL consisting of brown-gray silty CLAY. Trace of fine grain sand and crushed limestone. Dry.
6 - 7.5	1-1-1	FILL - same as above. Moist.
8.5 - 10	3-4-8	FILL consisting of brown-gray-black silty CLAY. Some fine to medium grain sand and crushed limestone. Dry.
		Fill apparently discontinues @ approx. 11'.
11 - 12.5	1-3-4	11-12' Dark gray very fine grain SAND. Moist. 12-12.5 Soft gray silty CLAY. Moist. Water @ 13'.
13.5 - 15	1-3-	Brown fine grain SAND. Wet.
16 - 17.5	1-3-5	Same as above.
18.5 - 20	2-6-8	Same as above; slightly siltier.
21 - 22.5	12-15-15	Same as above; less silt.
23.5 - 25	5-8-12	Gray very fine grain SAND. Wet.
26 - 27.5	12-10-10	Same as above.
28.5 - 30	6-8-10	Same as above.
		E.O.B. @ 30'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 4-13-87
Prepared by Tim Maley

Depth (ft) Description

EE-20



Boring/Well No. I-12/EE-20
Location Site I
Owner IEPA
Top of Inner Casing Elev. 411.41
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 2/13, 2/13/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers. Rotary

WELL DATA

Hole Diam. 8 in.
Boring Depth 28 ft.
Casing and Screen Diam. 2 in.
Screen Interval 23 - 28 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.41 ft.
Well Type monitoring
Well Construction:
Filter Pack 28 - 15 ft. Natural
Seal 15 - 13 ft.
Grout 13 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.49 Date 3-26-87
Static Water Elev. 398.91 Date 5-11-87
Slug Test Yes ____ No X
Test Date
Hydraulic Conductivity
Other

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-23-87
Samplers E & E
Samples Analyzed for HSL compounds, volatile organics

Split Samples Yes X No ____
Recipient Sverdrup, Inc. for Cerro Copper

Comments Subsurface soil samples from boring 3.5 - 12.5 feet analyzed for HSL compounds.

REMARKS

Background location

Site Dead Creek Site-I

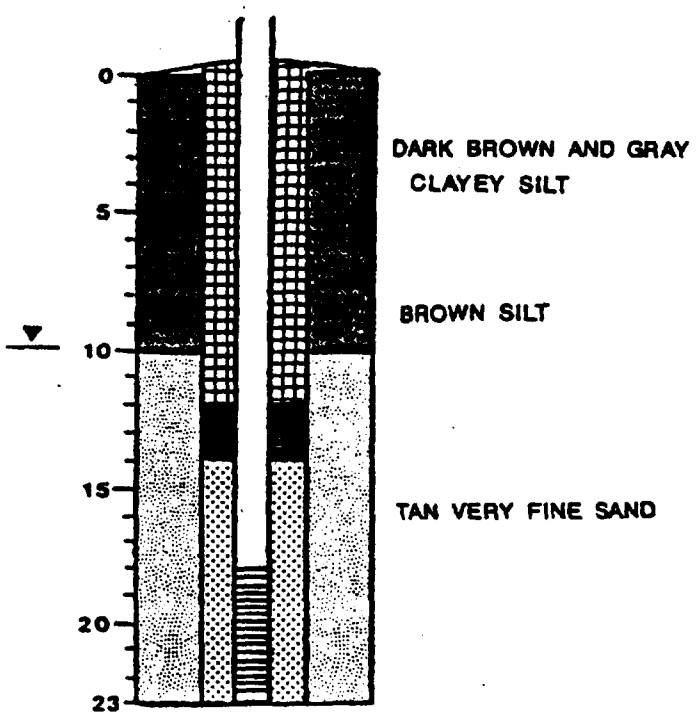
Boring/Well No. I-12/Well #EE-20

Sample Depth	Blow Count	Description
		Dark brown sandy clay topsoil on surface.
1 - 2.5	2-3-2	Brown silty CLAY. Dry.
3.5 - 5	3-3-2	Same as above.
6 - 7.5	3-3-5	Brown fine to medium grain SAND. Dry.
8.5 - 10	3-5-8	Same as above.
11 - 12.5	3-5-8	Same as above. Moist @ 12.5'.
13.5 - 15	4-8-13	Same as above. Wet.
16 - 17.5	1-2-4	Same as above.
18.5 - 20	2-5-9	Same as above.
21 - 22.5	3-5-11	Same as above.
23.5 - 25	4-7-11	Brown medium grain SAND. Wet. Trace of coarse grain sand @ 24-25'.
26 - 27.5	7-11-20	Same as above. Trace of small gravel. Wet.
		E.O.B. @ 28'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 2-25-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-G101



(IEPA well replaced)
Boring/Well No. EE-G101
Location Site G
Owner IEPA
Top of Inner Casing Elev. 412.35
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 2/25, 2/25/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 23 ft.
Casing and Screen Diam. 2 in.
Screen Interval 18 - 23 ft.
Screen Type stainless steel 0.01" slot
Stickup 2.51 ft.
Well Type monitoring
Well Construction:
Filter Pack 22.5 - 14 ft.
Seal 14 - 12 ft.
Grout 12 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 396.86 Date 3-26-87
Static Water Elev. 398.22 Date 5-11-87
Slug Test Yes X No
Test Date 5-12-87
Hydraulic Conductivity 1.3 x 10 cm/sec
Other pH = 7.0
Cond. = 1600 umhos Temp. = 58° F
Cloudy, yellowish

WATER QUALITY

Samples Taken Yes X No
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-17-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes No X
Recipient

Comments

REMARKS

Site Dead Creek Site-G

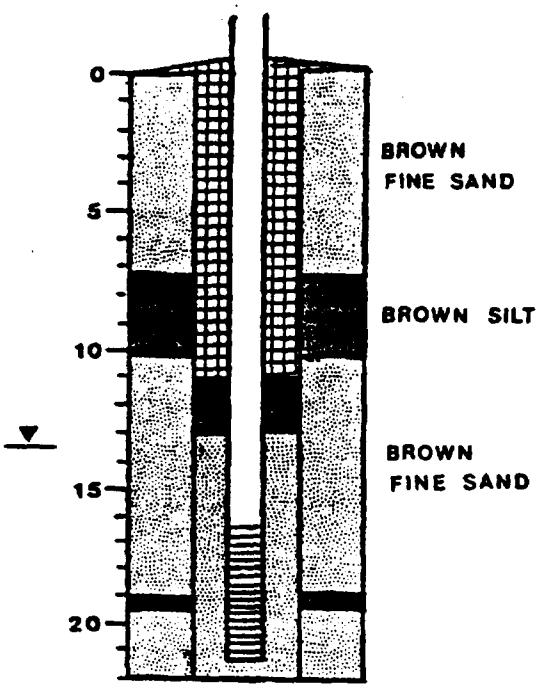
Boring/Well No. Well #EE-G101
IEPA replacement well

Sample	Depth	Blow Count	Description
			Straight drill boring.
			Stratigraphic sequence description taken from IEPA report (April 1981) log for monitoring well G-101 boring no. B-1 (10-8-80).
			0-7.5' Dark brown and gray clayey SILT. Trace of natural organics.
			7.5-10' Brown micaceous SILT. Water level @ 9.5'.
			10-15' Tan very fine grain SAND. Arenitic; moderately sorted to rounded. Contains ferro-magnesian minerals.
			15-32' Tan fine to coarse grain SAND. Arkosic, moderately rounded, poorly sorted, contains ferro-magnesian minerals with some medium gravel.
			E.O.B. @ 23 ft. (for replacement well #EEG101)

Project Name Dead Creek
Project No. IL 3140
Date Prepared 2-26-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-G 102



(IEPA well replaced)
Boring/Well No. EE-G102
Location Site G
Owner IEPA
Top of Inner Casing Elev. 409.10
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 2/26, 2/26/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 21.5 ft.
Casing and Screen Diam. 2 in.
Screen Interval 16.5 - 21.5 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.22 ft.
Well Type monitoring
Well Construction:
Filter Pack 22 - 13 ft. Natural
Seal 13 - 11 ft.
Grout 11 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.37 Date 3-26-87
Static Water Elev. 398.57 Date 5-11-87
Slug Test Yes X No
Test Date 5-12-87
Hydraulic Conductivity 1.4 x 10 cm/sec
Other pH = 6.8
Cond. = 1000 umhos Temp. = 56° F
Clear to yellowish

WATER QUALITY

Samples Taken Yes X No
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-24-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes No X
Recipient

Comments

REMARKS

IEPA well

MCO 6565851

Site Dead Creek Site-G

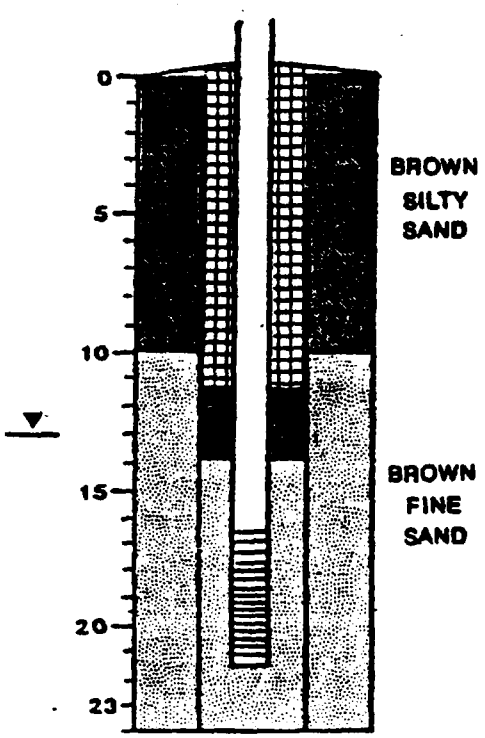
Boring/Well No. Well #EE-G102 (replacement well for IEPA G-102)

Sample Depth	Blow Count	Description
3.5 - 5	2-3-5	0-5 Loose brown silty fine grain SAND. Trace to little silt. Moist.
8.5 - 10	2-2-4	Loose brown sandy SILT. Some fine grain sand. Very moist.
13.5 - 15	2-3-5	Loose brown fine grain SAND. Well sorted and rounded to sub-rounded. Wet.
18.5 - 20	1-2-4	18.5-19 Gray silty fine grain SAND. Wet. 19'-19'10" - Gray very sandy SILT. Wet. 19'10"-20' - Gray very silty fine grain SAND. Wet. 20-21.5" - Gray fine, coarse grain sand (from IEPA log). E.O.B. @ 21.5'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 2-26-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-G103



(IEPA well replaced)
Boring/Well No. EE-G103
Location Site G
Owner IEPA
Top of Inner Casing Elev. 408.74
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 2/26, 2/26/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 23.5 ft.
Casing and Screen Diam. 2 in.
Screen Interval 16.5 - 21.5 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.08 ft.
Well Type monitoring
Well Construction:
Filter Pack 22 - 14 ft. Natural
Seal 14 - 11.5 ft.
Grout 11.5 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.43 Date 3-26-87
Static Water Elev. 398.57 Date 5-11-87
Slug Test Yes____ No X
Test Date
Hydraulic Conductivity
Other pH = 5.2
Cond. = 1200 umhos Temp. = 56° F
Cloudy, yellowish

WATER QUALITY

Samples Taken Yes X No____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-17-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes____ No X
Recipient

Comments

REMARKS

MCO 6565853

Site Dead Creek Site-G

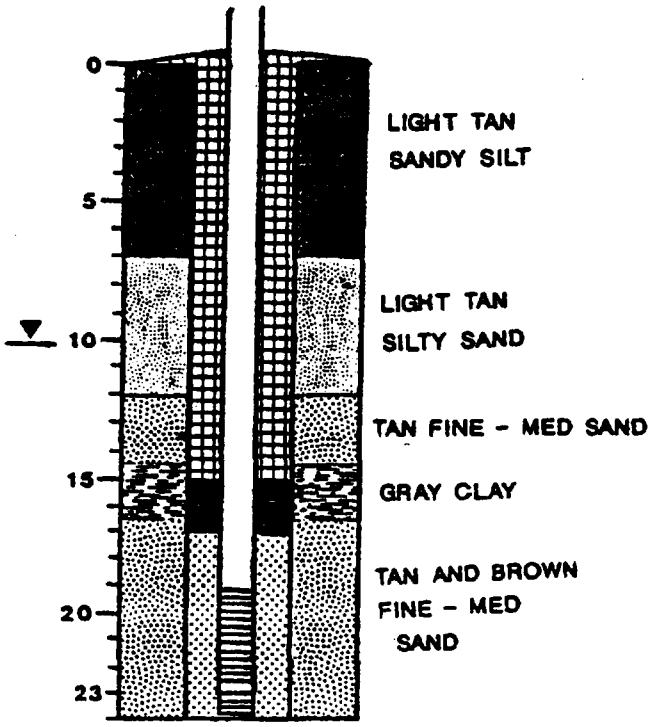
Boring/Well No. Well #EE-G103

Sample Depth	Blow Count	Description
		Straight drill to 8.5'.
		Stratigraphic sequence based on auger cuttings.
8.5 - 10	7-9-10	0-10 Firm brown very silty fine grain SAND. Some silt. Sand is well sorted and rounded to sub-rounded. Moist.
13.5 - 15	5-17-12	Firm brown fine grain SAND. Well sorted. Some black stained stringers throughout. Wet. Slight chemical odor.
18.5 - 20	1-2-3	Loose brown fine grain SAND. Well sorted and rounded. Trace of natural organic layers and wood particles. Wet.
22 - 23.5	5-9-9	Firm brown fine grain SAND. Trace of medium grain sand and small gravel.
		E.O.B. @ 23.5'.

Project Name Dead Creek
Project No. IL 3140
Date Prepared 2-25-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-G104



(IEPA well replaced)
Boring/Well No. EE-G104
Location Site G
Owner IEPA
Top of Inner Casing Elev. 408.96
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 2/25, 2/25/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 24 ft.
Casing and Screen Diam. 2 in.
Screen Interval 19 - 24 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.09 ft.
Well Type monitoring
Well Construction:
Filter Pack 24 - 17 ft.
Seal 17 - 15 ft.
Grout 15 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.01 Date 3-26-87
Static Water Elev. 398.24 Date 5-11-87
Slug Test Yes ____ No X
Test Date ____
Hydraulic Conductivity ____
Other pH = 6.5
Cond. = 1000 umhos Temp. = 54° F

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-17-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes ____ No X
Recipient ____

Comments ____

REMARKS

MCO 6565855

Site Dead Creek Site-G

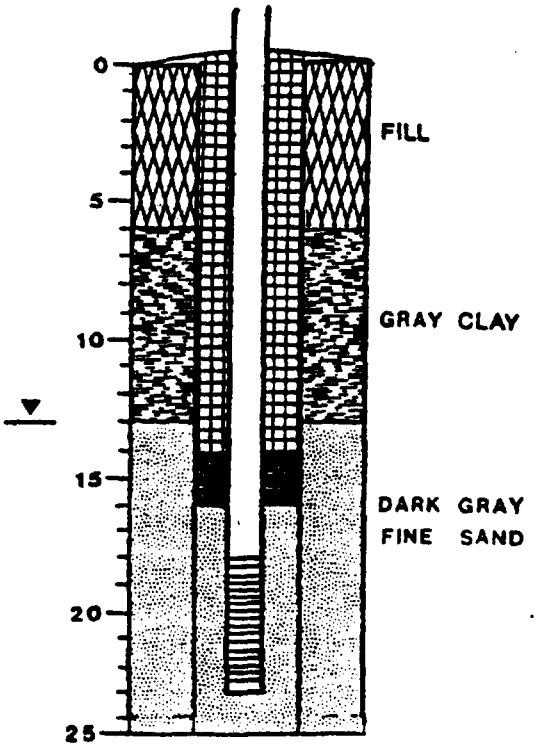
Boring/Well No. Well #EE-G104

Sample	Depth	Blow Count	Description
			Straight drill boring.
			Stratigraphic sequence description taken from IEPA report (April, 1981) log for monitoring well G-104 boring no. B-4 (10-9-80).
			0-7 Light tan sandy SILT. Trace of clay.
			7 - 12 Light tan silty SAND. Micaceous.
			12-14.5 Tan fine to medium grain SAND. Arkosic.
			14.5-16.5 Gray silty CLAY.
			16.5-37.5 Tan and brown fine to medium grain SAND. Arkosic. Poorly sorted. Subrounded. Trace of small gravel.
			E.O.B. @ 24' (for replacement well # EEG 104)

Project Name Dead Creek
Project No. IL 3140
Date Prepared 1-27-87
Prepared by Tim Maley

Depth (ft) Description

EE-G106



(IEPA well replaced)
Boring/Well No. G-4/EE-G106
Location Site G
Owner IEPA
Top of Inner Casing Elev. 407.97
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 1/26, 1/27/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 25 ft.
Casing and Screen Diam. 2 in.
Screen Interval 18 - 23 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.44 ft.
Well Type monitoring
Well Construction:
Filter Pack 23 - 16 ft. Natural
Seal 16 - 14 ft.
Grout 14 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.40 Date 3-26-87
Static Water Elev. 398.52 Date 5-11-87
Slug Test Yes ____ No X
Test Date
Hydraulic Conductivity
Other pH = 7.4
Cond. = 4200 umhos Temp. = 58° F
Dark, cloudy Strong organic odor

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-24-87
Samplers E & E
Samples Analyzed for HSL compounds, volatile organics

Split Samples Yes ____ No X
Recipient

Comments Subsurface soil samples from boring 5 - 20' analyzed for HSL compounds.

REMARKS

MCO 6565867

Site Dead Creek Site-G

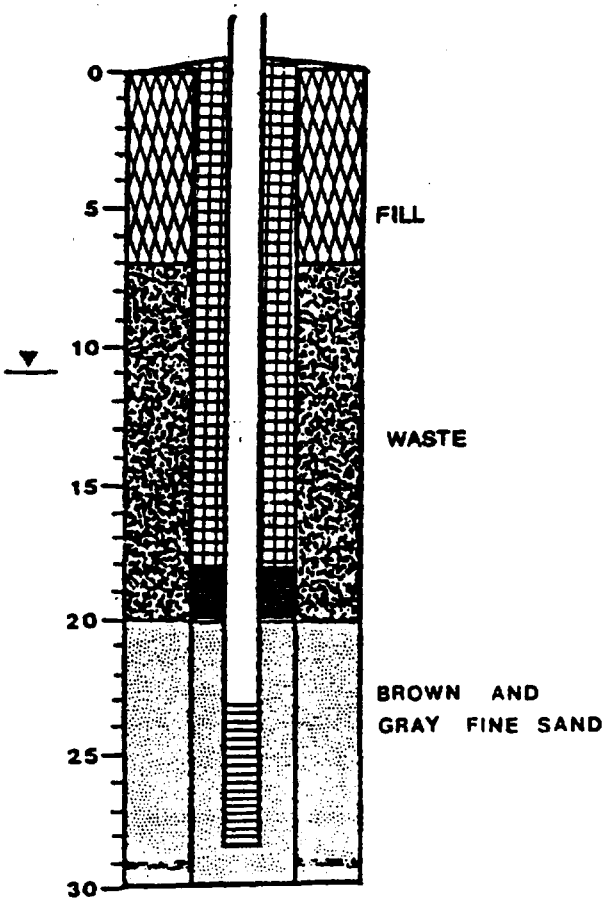
Boring/Well No. G-4/well #EE-G106
(IEPA replacement well)

Sample Depth	Blow Count	Description
1 - 2.5	15-7-9	FILL 0-1.5' Black sandy CLAY 1.5-2' Crushed limestone From 2' Gray silty clay. Trace of fine grain sand (dry).
3.5 - 5	1-2-2	FILL consisting of brown-black (mottled) silty CLAY. Trace of rust color and fine grain sand (dry). FILL discontinues @ approx. 6'.
6 - 7.5	1-0-2	Gray silty CLAY. Trace of very fine grain sand (moist).
8.5 - 10	1-2-2	Same as above with increased moisture and very fine grain sand.
11 - 12.5	1-2-2	Same as above. Some black staining at 12'.
13.5 - 15	1-2-5	Dark gray very fine grain SAND. Trace of silt and black staining (wet).
16 - 17.5	0-1-3	Black fine grain SAND (stained). Light and dark laminated banding of black staining (wet).
18.5 - 20	1-2-5	Dark gray fine grain SAND (wet).
21 - 22.5	4-9-8	Black fine grain SAND. Trace of silt (wet).
23.5 - 25	7-13-21	Gray fine grain SAND (wet).
		E.O.B. @ 25'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 2-23-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-G107



(IEPA well replaced)
Boring/Well No. G-6/EE-G107
Location Site G
Owner IEPA
Top of Inner Casing Elev. 406.67
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 2/23, 2/23/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D.
hollow stem augers, Rotary

WELL DATA

Hole Diam. 8 in.
Boring Depth 30 ft.
Casing and Screen Diam. 2 in.
Screen Interval 23 - 28 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.12 ft.
Well Type monitoring
Well Construction:
Filter Pack 28 - 23 ft.
Seal 20 - 18 ft.
Grout 18 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.15 Date 3-26-87
Static Water Elev. 398.32 Date 5-11-87
Slug Test Yes ____ No X
Test Date ____
Hydraulic Conductivity ____
Other pH = 4.8
Cond. = 3600 umhos Temp. = 62° F

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-18-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes X No ____
Recipient Enviropact

Comments ____

REMARKS

MCO 6565871

Site Dead Creek Site-G

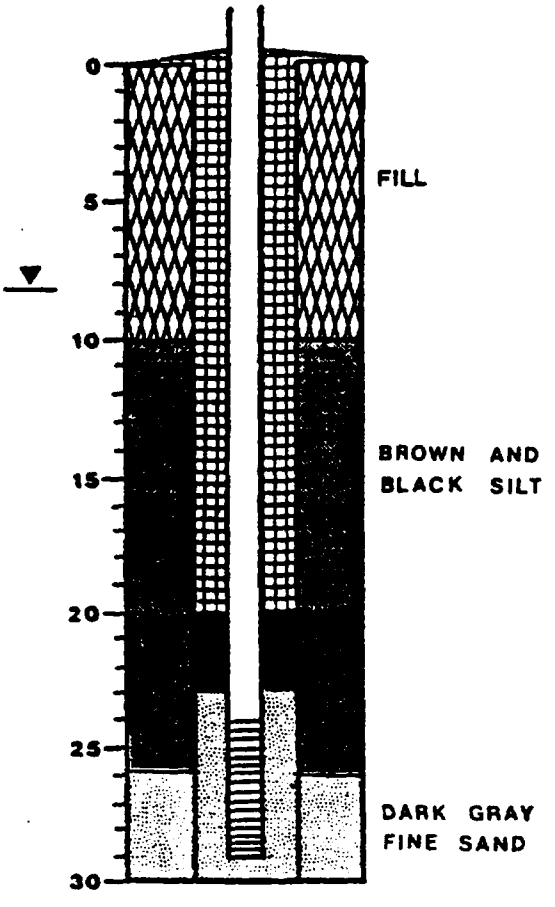
Boring/Well No. G-6/well #EE-G107
(IEPA Replacement well)

Sample Depth	Blow Count	Description
0 - 2.5	15-3-5	FILL consisting of loose fine to medium grain SAND. Trace of medium gravel, slag, and wood particles. (moist)
3.5 - 5	1-1-2	No recovery. Possible void in fill/debris material.
6 - 7.5	11-14-7	FILL consisting of various debris including wood particles, rubber, sand, and gravel. (moist)
8.5 - 10	2-3-24	WASTE consisting of black flaky material. Shale-like and fissile. (dry)
11 - 12.5	5-1-2	WASTE - same as above. (wet)
13.5 - 15	3-2-1	WASTE consisting of small to medium crushed gravel and cloth products. (wet)
16 - 17.5	1-1-1	WASTE - same as above with paper products. (wet)
18.5 - 20	1-1-1	WASTE consisting of black silty sludge. Some glass fragments and gravel. (wet) WASTE discontinues @ approx. 20'.
21 - 22.5	1-2-2	Brown-gray silty fine grain SAND. Well sorted and well rounded. 3 inch varved sandy silt layer in tip of spoon, sample stained throughout (wet).
23.5 - 25	1-3-3	Same as above. Obvious staining throughout sample. Soft gray silty organic clay layer @ 24'-24'3". (wet)
28.5 - 30	8-12-12	28.5'-29' Brown fine grain SAND. Trace of silt. (wet) 29'-29'2" Gray very silty organic CLAY. Trace of fine grain sand. 29'2"-30' Black stained fine to medium grain SAND. Well sorted and well rounded. (wet) E.O.B. @ 30'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 3-2-87
Prepared by Kevin Phillips

Depth (ft) Description

EE-G108



(IEPA well replaced)
Boring/Well No. EE-G108
Location Site G
Owner IEPA
Top of Inner Casing Elev. 407.21
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 3/2/87,3/2/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 30 ft.
Casing and Screen Diam. 2 in.
Screen Interval 24 - 29 ft.
Screen Type stainless steel 0.01" slot
Stickup 0.93 ft.
Well Type monitoring
Well Construction:
Filter Pack 29 - 22 ft.
Seal 22 - 20 ft.
Grout 20 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.96 Date 3-26-87
Static Water Elev. 398.85 Date 5-11-87
Slug Test Yes ____ No X
Test Date
Hydraulic Conductivity
Other pH = 5.4
Cond. = 1800 umhos Temp. = 56° F
Clear to cloudy No odor

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-18-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes X No ____
Recipient Enviropact

Comments

REMARKS

Site Dead Creek

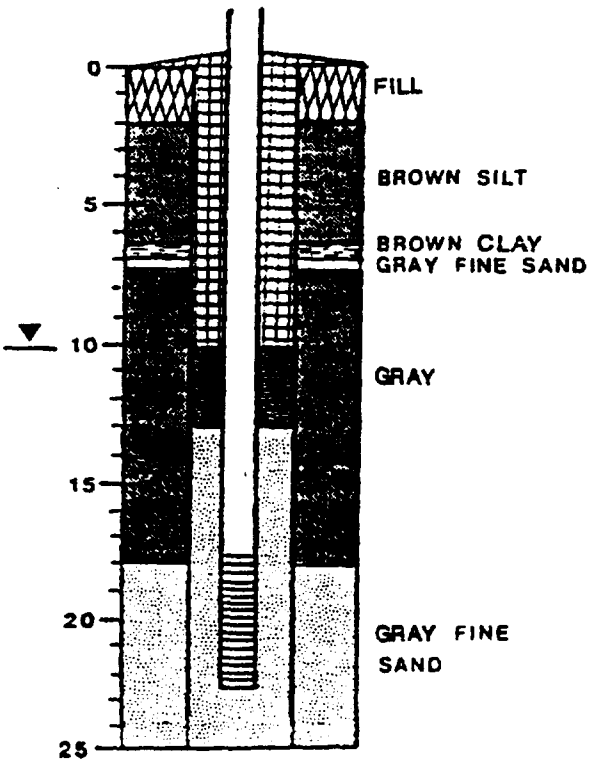
Boring/Well No. Well #EE-G108
(replacement well for IEPA G-108)

Sample	Depth	Blow Count	Description
			Straight drill to 23.5'
			Stratigraphy sequence based on auger cuttings.
			0-10 FILL consisting of brown-black very silty CLAY.
			10-23.5 Brown clayey SILT.
			23.5-25 Black very sandy SILT. Some fine grain sand. Very moist.
			28.5-30 Black to dark gray silty fine SAND. Well sorted. Wet.
			E.O.B. @ 30'.

Project Name Dead Creek
Project No. IL 3140
Date Prepared 12-16-86
Prepared by Tim Maley

Depth (ft) Description

EE-G109



(IEPA well replaced)
Boring/Well No. L-4/EE-G109
Location Site L
Owner IEPA
Top of Inner Casing Elev. 409.71
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 12/16,12/16/86
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 25.0 ft.
Casing and Screen Diam. 2 in.
Screen Interval 17.5 - 22.5 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.94 ft.
Well Type monitoring
Well Construction:
Filter Pack 25 - 13 ft.
Seal 13 - 10 ft.
Grout 10 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.42 Date 3-26-87
Static Water Elev. 398.45 Date 5-11-87
Slug Test Yes ____ No X
Test Date
Hydraulic Conductivity
Other pH = 5.0
Cond. = 4500 umhos Temp. = 58° F
Cloudy, dark, strong odor

WATER QUALITY

Samples Taken Yes X No ____
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-24-87
Samplers E & E
Samples Analyzed for HSL compounds, volatile organics

Split Samples Yes ____ No X
Recipient

Comments Subsurface soil samples from boring 10' - 20' analyzed for HSL compounds.

REMARKS

MCO 6565954

Site Dead Creek Site-L

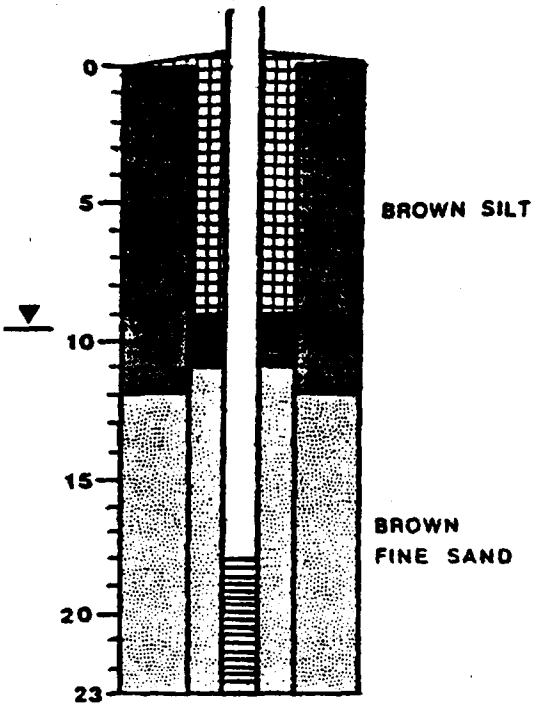
Boring/Well No. L-4/Well # EE-G109
(IEPA Replacement Well)

Sample Depth	Blow Count	Description
		0-2' FILL consisting of black asphalt and clay.
1 - 2.5	5-6-7	from 2' Brown sandy SILT. Moist.
3.5 - 5	3-3-4	Brown sandy SILT. Trace of medium grain sand.
6 - 7.5	3-4-4	6.5-7 Brown silty CLAY. Trace of fine grain sand. 7-7.5 Gray fine grain SAND. Trace of silt and clay.
8.5 - 10	3-4-6	Brown-gray (mottled) clayey SILT. Trace of fine grain sand. Moist.
11 - 12.5	4-7-8	Gray sandy SILT. Wet.
13.5 - 15	6-11-13	Same as above. Trace of fine grain sand.
16 - 17.5	8-14-34	Stiff gray sandy SILT. Thin laminated black-gray layering.
18.5 - 20	8-13-15	Gray fine grain SAND. Wet.
21 - 22.5	9-12-17	Same as above.
23.5 - 25	7-14-18	Dark gray fine to coarse grain SAND. Some black staining. Wet.
		E.O.B. @ 25'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 12-18-86
Prepared by Tim Maley

Depth (ft) Description

EE-G110



(IEPA well replaced)
Boring/Well No. EE-G110
Location Site G
Owner IEPA
Top of Inner Casing Elev. 409.00
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 12/18,12/18/86
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D. hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 23.0 ft.
Casing and Screen Diam. 2 in.
Screen Interval 18 - 23 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.82 ft.
Well Type monitoring
Well Construction:
Filter Pack 23 - 11 ft. Natural
Seal 11 - 9 ft.
Grout 9 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.49 Date 3-26-87
Static Water Elev. 398.52 Date 5-11-87
Slug Test Yes X No
Test Date 5-13-87
Hydraulic Conductivity 5.3 x 10 cm/sec
Other pH = 6.8
Cond. = 1200 umhos Temp. = 58° F
Clear to yellowish

WATER QUALITY

Samples Taken Yes X No
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-24-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes No X
Recipient

Comments

REMARKS

MCO 6565859

Site Dead Creek Site-G

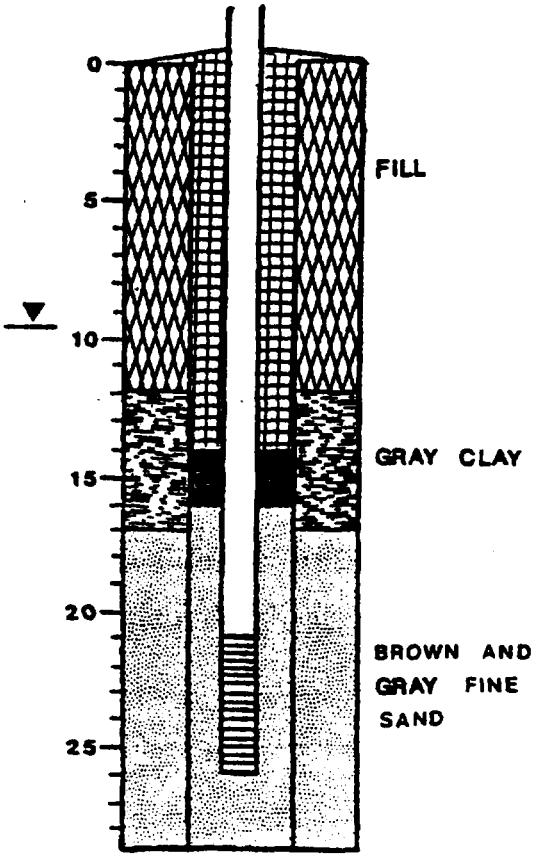
Boring/Well No. Well #EE-G110
IEPA replacement well

Sample Depth	Blow Count	Description
		Straight drill to 13.5'.
		Stratigraphic sequence based on auger cuttings.
		0 to 1' black topsoil.
		1 to 12' brown sandy SILT
		Begin sampling at 13.5'.
13.5 - 15	3-7-6	Brown silty SAND. Wet.
18.5 - 20	3-4-5	Brown to gray fine to medium grain SAND. Wet.
		E.O.B. @ 23'

Project Name Dead Creek
Project No. IL 3140
Date Prepared 2-3-87
Prepared by Tim Maley

Depth (ft) Description

EE-G112



(IEPA well replaced)
Boring/Well No. I-8/EE-G112
Location Site I
Owner IEPA
Top of Inner Casing Elev. 407.87
Drilling Firm Fox drilling
Driller Jerry Hammon
Start & Completion Dates 2/3/87,2/3/87
Type of Rig Mobile B-61

Method of Drilling 3 3/4" I.D.
hollow stem augers

WELL DATA

Hole Diam. 8 in.
Boring Depth 29.0 ft.
Casing and Screen Diam. 2 in.
Screen Interval 21 - 26 ft.
Screen Type stainless steel 0.01" slot
Stickup 1.19 ft.
Well Type monitoring
Well Construction:
Filter Pack 26 - 16 ft. Natural
Seal 16 - 14 ft.
Grout 14 ft. to surface
Lock No. 2834

TEST DATA

Static Water Elev. 397.00 Date 3-26-87
Static Water Elev. 398.39 Date 5-11-87
Slug Test Yes X No
Test Date 5-12-87
Hydraulic Conductivity 3.4 x 10 cm/sec
Other ph = 7.6
Cond. = 1600 umhos Temp. = 58° F
Yellowish, slight odor

WATER QUALITY

Samples Taken Yes X No
No. of Samples 1 round
Types of Samples groundwater

Date Sampled 3-23-87
Samplers E & E
Samples Analyzed for HSL compounds

Split Samples Yes No X
Recipient

Comments

REMARKS

MCD 6565915

Site Dead Creek Site-I

Boring/Well No. I-8/Well #EE-G112
IEPA replacement well

Sample Depth	Blow Count	Description
		Straight drill to 17.5'.
		Stratigraphic sequence based on auger cuttings.
		0'to 5' FILL consisting of brown fine to medium grain SAND including crushed limestone, gravel, and brick fragments.
		5'to 12' FILL consisting of black asphaltic sand and gravel including oily cinders and soft clay.
		Fill discontinues @ approx. 13'.
		12' to 17' Gray silty clay.
		17'to 23' Brown to gray fine grain SAND. Some silt. Wet.
		23 to 27.5' Brown to gray medium grain SAND. Trace of small gravel. Wet.
		27.5' to 27 3/4' Gray silty clay. Moist.
		27 3/4' to 29' Gray fine grain SAND.
Three samples taken for screen placement.		
17.5 - 19	2-3-4	Brown fine grain SAND. Wet.
22.5 - 24	4-5-7	Gray fine to medium grain SAND. Trace of coarse grain sand and small gravel. Wet.
27.5 - 29	6-7-9	4" gray silty clay layer on top of gray fine grain SAND. Wet.
		E.O.B. @ 29'